FOOD INDUSTRIES

manufacturing and processing

McGRAW-HILL PUBLISHING COMPANY, INC.
JAMES H. McGRAW, *Chairman of the Board*
MALCOLM MUIR, *President*

H. C. PARMELEE, *Editor*

M. A. WILLIAMSON
Publishing Director

New York, May, 1929

VOLUME I . . . NUMBER 8

Floundering Along Without a Research Department

WITHIN THE PAST MONTH a peculiar instance of a manufacturer's sudden scientific zeal has been brought to our attention. It is probably a case where the research department was non-existent, for it is unthinkable that it could have occurred had a live and well-trained man held this important post. The concern, a producer of baking powder, sought to gain a commercial advantage by incorporating the much-discussed vitamin D in its product by irradiation with ultra-violet rays.

The proposed step was entirely impractical, for the reason that more than ultra-violet rays are required to produce the antirachitic vitamin. The rays merely activate some sterol, presumably ergosterol, and produce a photochemical change that results in the substance called vitamin D—for lack of a more definite term. But in order to produce the vitamin the correct substance must be present for the rays to work upon. It happens that this particular baking powder is devoid of the material from which vitamin D may be generated, and hence the idea—ingenious though it may be—is a futile one.

Fortunately, however, the manufacturer was able to establish contact with competent scientific advice and has now learned what FOOD INDUSTRIES has advocated since its inception—that food manufacturers should study their own products from the vitamin D viewpoint, in particular at the present time, and know wherein their strength and weaknesses lie.

Standardized Food Containers Becoming Widely Used

FOOD MANUFACTURING groups are beginning to appreciate the great inherent advantage for their industries in adoption of size standards for food containers. During the past month there have been reported three important cases in which "Simplified Practice Recommendations" have achieved new dignity and effectiveness. Standard sizes of catsup-bottle neck finish were described in the April issue of FOOD INDUSTRIES.

There has often been a misunderstanding of the meaning of this movement toward uniformity in packages. Some big manufacturers have felt that they lost their identity and suffered some commercial disadvantage through adoption of standard sizes. Such fear has not been realized, for the very good reason that the adoption of container sizes under the Department of Commerce program is carried forward only when the industry itself takes the initiative and reaches substantially unanimous agreement.

There are still many cases in which hundreds of odd sizes of containers are used where a half dozen or dozen sizes would suffice equally well from the standpoint of both producer and consumer of the food. If any industrial unit believes that such a condition prevails in its business it will be well for the management of such concern to take up the question of simplification with the government staff which specializes on these projects. The officers of such companies need not fear that the government will take the matter out of their hands and try to "run the show" contrary to the best interests of any industrial group. They will get a very sincere and straightforward co-operation, which will facilitate a determination of the facts involved and insure prompt adoption of uniform package sizes only in such circumstances as can be justified on the score of both efficiency in production and effectiveness of distribution.

Byproduct Power Offers One Way to Plant Economies

THE LOW RETAIL PRICES at which one can regularly purchase Campbell's soups is possible only when manufacturing costs are correspondingly low. In the company's new plant, recently completed at Chicago, the greatest care has been exercised in design and equipment, to the end that every known operating economy will be utilized. Elsewhere in this issue is a very brief description of the major features of its power plant and a résumé of the reasoning that lay behind the choice of sizes and types of equipment.

The fact that roughly three-fourths of the heat units in steam are wasted when generating electric power in the best central-station practice is important to keep in mind. Heat in the central station may be saved and utilized for manufacturing by generating power at one's own plant and using the exhaust steam for processing. This may be accomplished by generating high-pressure steam and reducing the pressure through suitable engines or turbines. The problem of the proper balance between power and heat has been worked out to a nicety

in the Campbell Soup Company installation. The selection of a turbine-generator that may seem undersized at first glance is accounted for by the necessity for obtaining this balance.

Economies of this sort, whereby it is possible to produce electricity at costs that are ridiculously low, are not only possible in many plants, but they fairly cry out for some one with the vision to put them into effect. The power plant of another food manufacturer with national distribution recently showed a condition that is ideal for such an economy. The bill for purchased electricity runs into four-figured sums every month, and coal is burned to generate steam at the rate of a carload a day. With suitable engineering advice and a moderate investment that plant could generate its own power for almost nothing.

It is not necessary, however, to have a huge power plant in order to be able to economize. Plants that require as little as four to six tons of coal per day often present conditions that make it possible to save money in this way. It will pay all users of both process steam and electric power to study this question.

The Canners' Sub-Standard Bill Must Not Be Forgotten

ALTHOUGH the McNary-Mapes Bill failed of passage in the last session of Congress, there is every reason to believe that it will be again presented at the next session, and that it will probably pass. The desire of Senator Copeland, of New York, to add a small amendment that would tend to strengthen the bill, by requiring the Department of Agriculture to announce the standards required within two years, was the cause of its failure to pass under the unanimous consent rule that was in force at that particular session of the Senate.

The bill would have required that canned foods of sub-standard quality must carry some form of designation to that effect, so that no ultimate purchaser could ever be misled into believing that he or she was purchasing a better grade of quality. That it could not have been enacted is regrettable, for it was one of the most constructive moves that the industry has fostered. The day of improvement has been deferred for a time, but a worthy measure such as this must not be allowed to die from lack of support by all of us.

Are Cigarette Ads Proving a Boomerang?

MONTHLY SALES of confectionery as reported by the Foodstuffs Division of the Bureau of Foreign and Domestic Commerce indicate a substantial growth in 1929 over the corresponding months of the preceding year. Some confectionery men, we are told, take this as evidence that cigarette advertising which criticizes confectionery has proved a boom, not a detriment, to the candy business. They reason that there are as many people who would like to get fat as there are who would like to get slim. They conclude that these under-weight individuals now "Reach for a sweet and quit smoking."

When a man starts to throw stones he can never be sure that it may not be his own plate-glass window that will be broken.

Farmers Recognize the Influence of Sugar Tariff on Grain Plantings

AGRICULTURE in sugar-beet growing states has shown itself to be very conscious of the possible repercussion of any tariff adjustments on raw cane-sugar entering the United States. Editorials in leading farm papers indicate that our policy in the Philippine Islands and toward Cuba on the question of sugar will have a very definite influence on plantings of small and coarse grains in the beet-sugar states. Some of them plead with the farmer to carry on with the beet-sugar mills, somehow, as a means of reaching an ultimate solution; others have no remedy other than to urge the farmers to give political support to the tariff problems of an industry that pays them cash for their crop. But agriculture feels a very direct monetary interest in our international and colonial relations.

Unethical Practices Becoming Unfashionable

THERE ARE FASHIONS in hats; and apparently there are also fashions in merchandising and in trade practices. It has long been recognized as a principle of salesmanship that "knocking" a competitor is poor business. Now it is becoming not only unethical to do so, but under the terms of trade practice agreements it becomes practically illegal. The creamery industry sets forth in resolution form such unfair practice in the following language:

"That the making, causing, or permitting to be made or published any false or untrue statement of or concerning the business policies or methods of a competitor is hereby declared unfair."

This resolution takes on added dignity since it was adopted at a meeting gathered under the auspices of the Federal Trade Commission. Such findings, which are clearly the consensus of opinion of a large majority of an industry, can be and frequently are used by the Federal Trade Commission in prosecuting suits or issuing of orders to cease and desist.

Prejudice Still Hampers These Stepchildren of the Kitchen

CERTAIN PRODUCTS of the food industry the public—and also a few scientists—treat with some disfavor. They are not regarded as exactly unwholesome, but as rather lacking in food value or as unworthy substitutes for more valuable foods. In the light of cold scientific fact this attitude is frequently totally unjustified. Typical examples of this attitude are corn sirup, gelatin, and skimmed milk.

Some people feel that corn sirup is a cheap adulterant for cane sugar, less sweet and undesirable because of its lower cost. Others believe that it is liable to be definitely poisonous. It is true that several decades ago some people were poisoned in England by drinking beer. The poison was arsenic, and it was traced to liquid glucose (the British term for what we call corn sirup), and in turn to the sulphuric acid used in its production. But today, with pure food laws, limitation of the arsenic content of foods, and the high standards set by manufacturers, such a case is in the highest degree unlikely.

Admittedly corn sirup is less sweet, but that is frequently advantageous where sugar in large percentage serves as a preservative. Viewing it scientifically, all starches and sugars introduced into the body—bread, pie crust, the sugar in your coffee—are changed to dextrose (glucose) and circulate as such in the blood stream. It is the natural body sugar, easiest of digestion. Doctors recommend and prescribe corn sirup in baby-feeding formulas. What is safe and good for the baby is doubly so for the rest of us.

Gelatin is disliked partly on account of old and unappetizing methods of manufacture, and partly because scientists have classed it as an "incomplete protein." The first objection has been removed in modern gelatin works by strict sanitation. The second is true only in so far that when gelatin forms the *only* protein in the diet, it cannot provide all the amino-acids (of which our tissues are built up) necessary to support life. But why use gelatin as the only protein in the diet?

The rich flavor of cream and butter, the system of paying for milk only according to its fat content, have made the average man think of skimmed milk as a valueless product, robbed of all its goodness when the cream was taken off. This attitude is wrong. It is rich in carbohydrate, body fuel; in valuable proteins, tissue-builders; in mineral salts, vital for bones and teeth; in the water-soluble vitamins of milk, essential to proper metabolism.

Each of these stepchildren is slowly but surely fighting its way into recognition of its merits. This is being done in various ways. The product is offered to the consumer in more attractive or handier forms—fruit jellies, crystalline corn sirup, and dried skim milk. At the same time the consumer is being educated to the advantages and uses of these products.

Some day the public will appreciate properly the virtues of the foods it once despised. There are fashions in everything and the once lowly sauerkraut is now a juicy feature of the breakfast tables of our best hotels. Education of the public did it, education founded on the solid merits of the product.

Is There Such a Process as Preservation by Putrefaction?

RECENTLY a speaker of scientific attainments, when discussing methods of preservation of foods, gave to his audience a sizable jolt when he referred to putrefaction as a method of preservation. The immediate reaction of one member of the audience was that this method of preservation could be classed as comparable to burning the house in order to save it. But though it is recognized that spoiled foods may sometimes be eaten with impunity, and occasionally with pleasure, one would hardly be justified in classing them as preserved because they are still edible without disastrous results.

Indians of the Northwest are known to relish salmon in an advanced stage of decomposition, and the Chinese are said to partake of eggs whose odor leaves no doubt in the mind of an Occidental that they are "pre-war stuff," although one is not quite certain as to just which war. There is also a Scandinavian fish product in which the presence of mercaptans and hydrogen sulphide leads one to forget that the objects before him were once living things.

These forms of putrefactive decomposition (or semblances of decomposition) are ascribed by some to purely chemical changes; though by others they are regarded as of bacterial origin, it hardly seems quite appropriate to say that putrefaction is a method of preservation. Our own feeling is that when microorganisms play a favorable rôle in preservation they bring about the formation of substances that are, in themselves, either chemical preservatives or antiseptics. The commonest of substances formed in this way are lactic acid, acetic acid, and alcohol. All of these substances arise from the decomposition of sugar. Hydrogen sulphide and mercaptans and the like—products of protein decomposition—are not to be considered as preservatives of any importance, if indeed they will inhibit bacterial growth at all. Therefore, in correctness there cannot be said to exist preservation by putrefaction. Rather should one regard these particular putrefactive processes as constituting agencies of ripening for flavor, as is conspicuously exemplified by certain cheeses and game animals—whether of the field or the forest.

Science Produces a New Sausage Casing

THE presence for so many years of the ubiquitous "hot dog" would hardly lead one to believe that any radical changes could be made in the method of preparation of this deservedly popular food product. Nevertheless, the development of synthetic cellulose casing has brought to football and prize-fight fans and to automobile tourists their favorite refreshment in a jacket made from materials grown in a field rather than in the interior of a sheep.

Heretofore, the manufacturers of wieners and frankfurters have relied on casings made from the small intestines of sheep. The number of casings available from sheep slaughtered in the United States has been quite insufficient to supply the needs of the industry, and importation has been necessary. Imports of sheep casings amount to about $10,000,000 annually, a rather surpising amount to the uninitiated. Russia, Siberia, Mongolia, Manchuria, Turkey, Morocco, Argentina, Chile, Australia, and New Zealand are the principal exporters, and searchers have explored, by canoe, camel and donkey, even more remote corners of the world for additional sources of supply. Though this may sound romantic, practically, with increased distance from civilization, it becomes more and more difficult to get proper workmanship and the sanitation necessary for a food product. Incidentally, it is of interest to know that even in the remotest places there are enough buyers to assure keen competition.

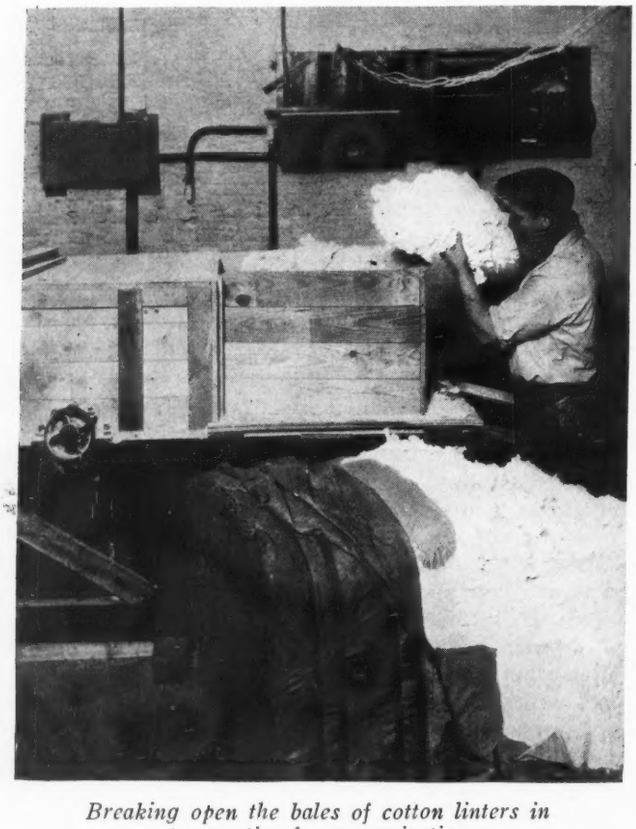
The necessity for a synthetic sausage casing has been felt for a number of years. The British Patent Office, in a handbook for the use of inventors, included a sausage casing as a needed invention. Probably a good hundred patents have been issued for synthetic casings, but only one has been commercially developed. It is described fully in this issue of FOOD INDUSTRIES. This successful development was the result of three things: planning the attack on the problem; making experimentation complete; and interpreting the results intelligently. When economic pressure invites the invention of new products or processes, order in attack, thorough experimentation, and intelligent interpretation are a pretty good recipe for success.

The Manufacture of Seamless Cellulose Tubing

By WILLIAM F. HENDERSON
Chief Chemist, the Visking Corporation, Chicago

THE production of thin-walled seamless cellulose tubing has been closely associated with the meat-packing industry because it was developed for the primary purpose of serving as a casing for sausages. Casings ordinarily used in the sausage industry are derived from the alimentary tract of cattle, sheep, or hogs. These animal casings have served the purpose as a food container for many generations, but, owing to an occasional shortage in the supply, especially of sheep casings, which are the most desirable, and because of much irregularity in the quality of all such products, the desirability of developing a synthetic container has long been recognized.

Many attempts have been made to produce synthetic meat containers either by impregnating a fabric with some sort of filler or by re-vamping animal casings of various kinds into casings of small diameter. Only two attempts of note have been made actually to produce a seamless tube from raw materials which are not dependent upon the packing industry itself for their origin. The first to come to the attention of the public was the work of Wallace P. Cohoe, who, in 1913 and 1915, received patents for the production of seamless tubes of cellulose made by the viscose process. Cohoe's tubes were relatively thick-walled and were intended especially to be used as a container for the larger smoked meats. The combination of world conditions in general, during those years and the years immediately following, was not favorable to the development of the new product, nor had the art of viscose fabrication on an elaborate and profitable basis been realized. Consequently, little development work was done by Cohoe and his associates, and before long the subject was abandoned.



Breaking open the bales of cotton linters in preparation for mercerization

The second attempt came in 1916, when Erwin O. Freund established at the Mellon Institute of Industrial Research, at Pittsburgh, Pa., a fellowship, the purpose of which was to produce a synthetic casing. Freund was engaged in the sausage casing business and early saw the need of a synthetic product which would at first supplement, and ultimately replace, the only partly satisfactory animal containers. This industrial fellowship was in almost continuous operation for ten years. Freund's faith in chemical research was of a most unusual type, as was shown by his persistence even after very meager results had been obtained over a period of several years. Even in the face of apparently certain failure of the investigations, Freund "knew it could be done and the right chemical combination would do it." His patience and faith in research did not go unrewarded, for at the end of the tenth year a casing was produced that met the requirements.

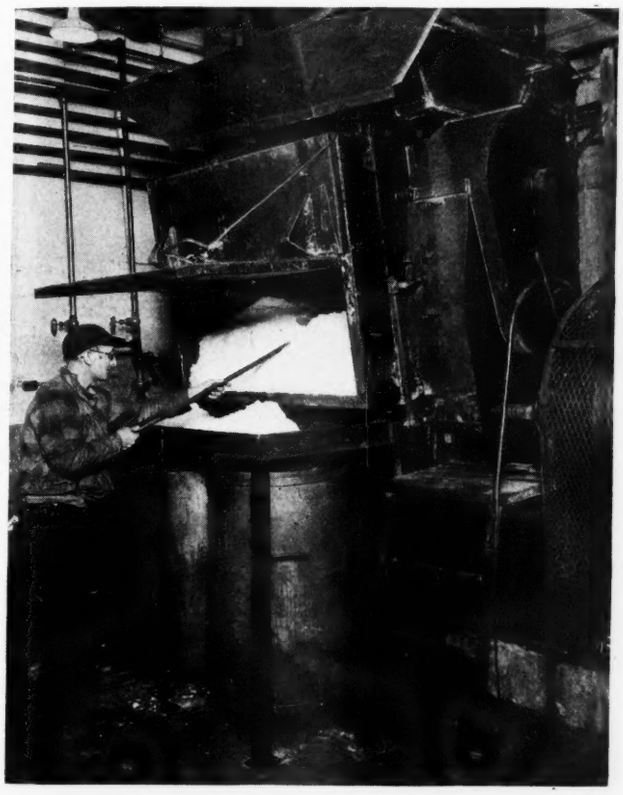
The results of the research at Mellon Institute were followed up with all possible care and speed, and in three years a plant was developed which now manufactures approximately fifty miles of seamless cellulose tubing every day.

In the process of manufacture the first step consists in the opening up of the bales of purified cotton linters—the basic raw material. The linters are mercerized by means of sodium hydroxide solution in large agitators. At this point, temperature control enters the process and it continues to be one of the most important single factors throughout the entire chemical application of the method. The temperature of the sodium hydroxide solution is carefully controlled and the duration of the reaction is timed exactly. The resulting alkali-cellulose sludge is pressed to eliminate the excess of sodium hydroxide and the alkali-cellulose cake is shredded for several hours in a standard Werner-Pfleiderer shredder. During all of this shredding period, the reaction of the alkali on the cellulose continues, making it necessary to control the temperature during the shredding process.

The crumbs of alkali-cellulose that come from the shredder are next treated with the vapor of carbon disulphide. This is accomplished in a large rotating hexagonal drum, called a baratte. Constant temperature conditions must be maintained here also, and conse-

quently the baratte is water-jacketed and heat-insulated at the necessary points. The reaction with carbon disulphide requires three hours, and the resulting product, cellulose xanthate, comes out as a loose, crumby material, brilliant orange in color.

Cellulose xanthate is soluble in water, especially with



Crumbs of alkali-cellulose being dumped from Werner-Pfleiderer shredder

the aid of a small amount of sodium hydroxide. The brown viscous solution is called viscose. Dissolving of the xanthate to form viscose takes place in a vertical type of mixer known as a vissolver. In this mixer, rapidly rotating paddles cause the liquid to circulate down through the middle and up along the sides. Here again it is important to maintain a constant temperature. A brine jacket around the vissolver makes it possible to maintain a practically uniform temperature during the mixing period. By means of this piece of equipment it is easily possible to mix a five thousand pound charge of viscose in two hours.

Viscose cannot be used immediately after mixing—for two reasons. First, it is full of tiny air bubbles, which are produced by the turbulent agitation in the vissolver; and second, freshly made viscose will not solidify or precipitate quickly in the acidified salt baths that have been found to be most desirable to use. As the viscose stands, it undergoes a gradual change, called ripening, the result of which is a material, higher in viscosity, that will immediately become solidified when it enters acidified salt solutions. The rate at which ripening takes place is a function of the temperature; consequently, in order to furnish a regular and uniform supply of viscose for casting tubes, the ripening room must remain at a uniform temperature.

The viscose is stored in the ripening room in tanks that are arranged in series. Compressed air forces the viscose from one tank to the next, and when the material has passed through the entire series it has also been subjected to filtration and evacuation. At the end of the ripening cycle, which requires four and one-half days at 18 deg. C. (64.4 deg. F.), the viscose is ripe and ready for use. The following table shows how closely the ripening room temperature is held. The figures were taken from the daily report sheet of March 29, 1929, and they are representative.

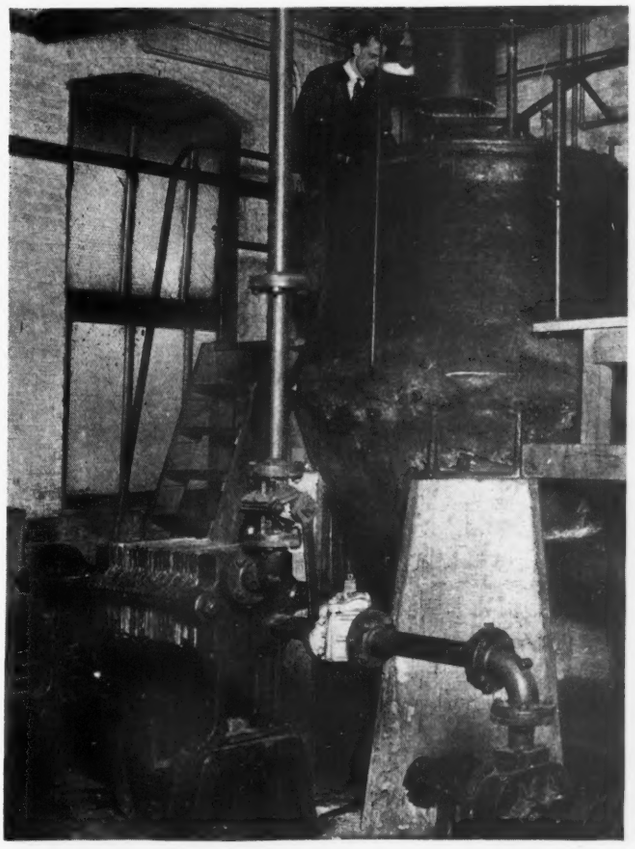
Ripening-Room Temperature Control

Temperature in Degrees Centigrade

Time, Hours	Midnight to Noon	Noon to Midnight
12	18.2	18.2
1	18.0	18.3
2	18.0	18.2
3	18.1	18.3
4	18.2	18.2
5	18.2	18.1
6	18.3	18.2
7	18.3	18.2
8	18.2	18.2
9	18.3	18.2
10	18.2	18.2
11	18.3	18.2

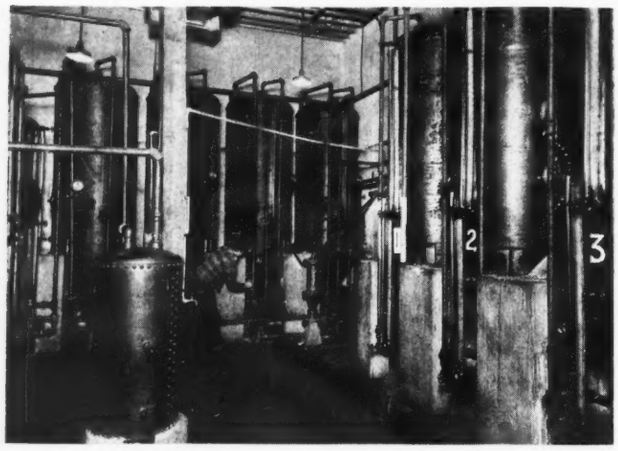
The filtration removes any undesirable particles that would mar the films and the evacuation removes all air bubbles, the presence of which would form weak spots or holes.

Pipe lines convey the ripe viscose to the casting machines, where the formation of the seamless tubes takes place. The casting machine consists essentially of a concentrically arranged nozzle and core which project



Vertical type of brine-jacketed mixer used to convert cellulose xanthate to viscose by solution in dilute sodium hydroxide

through the bottom of a small tank. A gear pump meters the viscose through the annular orifice between the nozzle and the core into the tank, which is filled with the hardening bath. A long overhead roller, turning at constant speed, draws the hardened viscose tubes away from six orifices at once and subsequent rollers convey the tubes into other tanks for further treatment. The thickness of the tube wall is governed by the rate at which the viscose is fed by the gear pumps as compared with speed of the overhead withdrawal roller, which exerts a constant stretching effect on the viscose tube. A small amount of the hardening liquor is led through



Ripening room where viscose is passed through a series of tanks, being carefully filtered and evacuated en route

the nozzle, which is hollow, into the interior of the viscose tube. This internal hardening liquor solidifies the interior surfaces, thus avoiding any tendency of the walls of the tubing to stick together. A central drain tube situated within the core allows the exhausted internal bath liquor to drain away.

The freshly formed seamless tubes, which now consist partly of cellulose and partly of undecomposed viscose, must undergo further treatment in baths which will complete the transformation of viscose back to cellulose. Byproducts of the reaction, consisting principally of gases, salts, and colloidal sulphur, are removed by washing, first in cool, then in hot, water, as the cellulose tubes are carried along by properly driven rollers.

The cellulose tubes which issue from the last wash tank are transparent and colorless in appearance and are neutral to such chemical indicators as methyl orange. Squeeze rolls eliminate the excess of water before the cellulose tubes pass through a bath of dilute glycerin. A second set of squeeze rolls reclaims the excess of glycerin solution, and the glycerinated tubular films pass on into receivers called sliver cans—a term borrowed from the textile industry.

Cellulose films produced in the manner just described will shrink enormously if permitted to dry in a relaxed condition. Because of this fact, the sliver cans are provided with closely fitting covers, which prevent the loss of moisture from the cellulose.

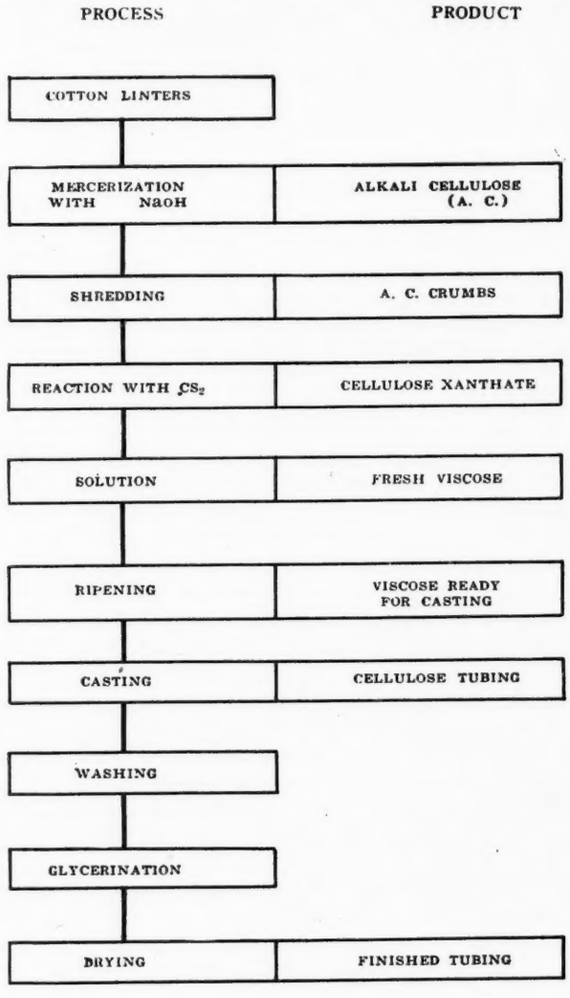
To maintain the proper diameter of the cellulose tubes while they are being dried, a tension must be exerted on them, and the most efficient manner of applying this tension is by inflation. A single drier consists of a set of twelve wire mesh tubes, each thirty-five feet long, supported in a warm air tunnel. The internal diameter of each wire tube is just the size desired in the finished cellulose tube. The moist cellulose tubes are led through the wire tubes, and low pressure air is admitted into one end, the other end being plugged off. By air pressure the tubes are inflated tightly against the wire, and the drying which follows yields a thin-walled product of the desired dimensions. When dry, the twelve cellulose tubes are drawn out, and, simultaneously, twelve moist tubes are drawn in from the sliver cans.

The thirty-five foot lengths of dry tubing are cut off and laid on long tables. Each table is provided with a shirring mandrel, which is constructed so that the diameter may be altered. The mandrel is expanded to its full size and a length of cellulose tubing is shirred on. By relaxing the mandrel, the shirred tube may be transferred to a hardwood dowel. The thirty-five foot length of cellulose tubing, closely shirred on the fourteen-inch dowel, constitutes the unit of production for the sausage industry. Two hundred of these units are packed into a carton, which, when sealed and labeled, is ready for shipment.

At present four standard diameters of small tubing are being manufactured. The small sizes range from $\frac{3}{4}$ in. to $1\frac{1}{8}$ in., with a wall thickness of 0.0007 in. The large size is $2\frac{1}{4}$ in. in diameter, with a wall thickness of 0.002 in.

Inasmuch as the primary object of this entire development was the production of a new sausage casing, prac-

Flow Sheet for the Production of Cellulose Tubes



Casting machine forming cellulose tubes, which can be seen passing through the unit, glycerin being added between the two large squeeze rolls. The moist casings are collected in the silver cans shown in the foreground

Shirring 35-ft. lengths of dried cellulose tubing on collapsible mandrels, from which they are transferred to short lengths of dowel rod. Driers in the background

tically the entire effort of those developing it was exerted to adapt it to the packing industry. The use of the cellulose casing in a dry condition saves the sausage maker a great deal of time and labor. No spoilage results when the casing is stored, no soaking and flushing are required as with animal casings, and much less time is consumed in "loading" the stuffing horn. Uniform

After being smoked and cooked the frankfurters are cut apart and the cellulose skins rapidly peeled off

diameter and lengths, freedom from holes, rare bursting during stuffing, all contribute to greater efficiency in the filling operations. Linking, smoking, and cooking are carried out in the usual manner.

It is a characteristic of cellulose films not to adhere closely to much of anything, and the cellulose sausage casing is no exception to this rule. For this reason, the cellulose casing can be stripped away very readily from frankfurter or other forms of sausage after the regular processing is finished, and a truly skinless product results. Even though the Bureau of Animal Industry approved the new casing as harmless and comestible, it seemed wise to remove the casing at the sausage factory in order that a completely tender and attractive product be made. When given a little training in the work, an operator can easily remove the skins from 150 to 200 pounds of frankfurters in an hour.

As the manufacture of cellulose tubing began to increase, other applications and uses began to appear. Among the earliest to demand attention was the use of the cellulose tube as a medium for dialysis, especially in medical and bacteriological work. Though this outlet for tubing probably will not reach large proportions, the cellulose film in tubular form seems to fill certain requirements that heretofore have been realized only in part.

The cellulose tube furnishes an admirable tubular container for many articles which might be sold in a closed transparent wrapper. Tooth brushes, cigars, and certain kinds of candies are excellent examples of this application. By filling the tubes with half-frozen ice cream or flavored ices, linking as is done in wieners, and subsequently chilling and hardening, a very interesting and attractive "cold dog" is produced.

To contend that seamless cellulose tubes can be used in all applications where a tubular container is desired would be misleading, but many additional successful applications of this new series of products will probably be found at time goes on.

Unexpected Variation in the Mineral Content of Cereal Grains

"WITH the rapidly growing knowledge of the physiologic importance of food factors that are usually present only in small quantities in our diet, more attention is being paid to these formerly neglected components, says the Journal of the American Medical Association for April 13. This statement applies conspicuously to certain inorganic elements in the diet and to the newly recognized vitamins. A generation ago iron, the conspicuous inorganic component of the red blood corpuscles, was almost the only mineral nutrient to receive extensive discussion in relation to food problems. Today the situation has changed. Not only do calcium and phosphorus share in dietary interest, but the reaction of the food intake—its potential acidity or basicity—elicits consideration. One even hears about relative proportions as well as absolute quantities of the mineral elements involved in food.

Alert advertisers have not been slow to grasp the apparent significance of such items in relation to many foods whose sale is being promoted through prominent reference to specific nutrient virtues. This is conspicuously true of the cereal products that enter so largely into the American regimen. A recent study by Greaves and Hirst at the Utah Experiment Station in Logan is of interest in this connection, for it illustrates that the mineral content of the common grains, wheat, oats, barley and corn, show surprisingly large variations when many samples grown under diverse agricultural conditions are examined. For example, wheat grown in some localities was found to carry six times the calcium of wheat grown in other localities. Wheat raised with 67½ in. of irrigation water contained 2.6 times as much calcium as did similar wheat grown on similar soil without irrigation water. Some varieties of wheat even though grown under similar conditions contained twice the calcium found in other varieties. Similar variations existed in the case of the oats and barley. Many of these grains were grown on highly calcareous soil and often with irrigation water, which are the reasons for the high calcium content of these grains. Similar variations were found in the content of potassium, phosphorus, magnesium and iron.

The question may well be raised whether such features may materially modify the nutritive value of grains grown on highly fertile calcareous soils in contrast with the usual condition. One is dealing with small differences, yet the nutritive needs likewise are comparatively small. In any event, the Utah reports indicate the futility of making bold generalized claims for differential mineral value between the common cereal products so long as the source and cultivation of the grains in question is neither known nor recognized."

Molasses in Greek Alcohol Manufacture

Greek alcohol is almost exclusively derived from black currants, and the utilization of molasses in alcohol manufacture is ordinarily prohibited. Because of a small currant crop in 1928, the Greek government, by a decree of Dec. 31, 1928, authorized the use of molasses in alcohol distilleries up to Aug. 31, 1929. The duty-free importation of molasses has been permitted up to July 31, 1929.

Factors Affecting the

RELATIVE POTENTIALS OF TIN AND IRON*

By E. F. KOHMAN and N. H. SANBORN

Research Laboratory, National Canners Association
Washington, D. C.

TIN, as we have previously reported,[1] may be less noble than iron in canned fruits. Evidence indicates that this is generally the case for canned fruits within a relatively short time after canning. When two metals are exposed to such a medium as fruits, a galvanic current is set up which causes the less noble of the two metals to corrode more intensely than would be the case if a more noble metal were absent. It has always been assumed that tin is more noble than iron. On this basis, the tin of the can would cause the iron to corrode excessively. The fact that conditions in a can of fruit, from the standpoint of corrosion, are thus the exact reverse of what has long been assumed, throws an entirely new light on this problem.

Subsequent to our report, Lueck and Blair,[2] as well as Culpepper and Moon,[3] have reported similar findings. In our report we did not attempt to explain the reason for our findings but limited ourselves to data which demonstrated the condition that actually exists. Lueck and Blair explained the fact that tin is less noble than iron in canned fruits on the basis of overvoltage, of which more will be said below. We do not feel, however, that overvoltage can account for any more than a temporary reversal of the relative nobility of tin and iron.

Culpepper and Moon attempt to explain the relative nobility of tin and iron, in canned fruits, on the basis of the presence of ferric iron—that is, iron oxidized to its highest state. In our work we carefully exclude oxygen, and when oxygen is excluded it is impossible for ferric iron to exist when metallic iron is in contact with an acid medium such as fruits. Culpepper and Moon's explanation, therefore, is not tenable. The purpose of this paper is to give some factors which are shown in a definite manner to affect the relative nobility of tin and iron.

In order to make a technical problem understandable to those who have not followed it in its details, it is necessary to present a few fundamental principles.

Metals, when exposed to a medium such as fruits, have a tendency to dissolve. This tendency is called their solution pressure. The solution tendency of metals, however, presents a condition different from that when non-metallic substances dissolve, such as sugar. Whenever an atom of a metal enters a solution, it acquires two + + charges of electricity. This leaves the remaining metal with two — — charges of electricity, causing the metal to become electrically charged, and its electrical charge is negative to the medium in which it is placed. The difference in electrical charge of the metal with respect to the medium is known as its potential and may be measured electrically. A second metal placed in the same medium also acquires a negative potential with reference to the medium, which is characteristic of it. Although both metals are negatively charged with reference to the medium in which they are placed, the negative charge of the first may be of considerably greater magnitude than that of the other. This first metal, therefore, is negatively charged with reference to the second metal. In common terms, it is less noble than the second metal, and nobility in this connection has reference to the ability of the metal to resist tarnishing or corrosion in contact with the medium in question.

The less noble of the two metals, therefore, has a tendency of its own to corrode to a greater extent. When in contact with a more noble metal, this tendency to corrode is enhanced because of the flowing of the electric current from the more noble to the less noble metal. If they are in electrical contact, the current which flows between the two metals in such condition is designated as a galvanic current, and the two metals are said to constitute a galvanic couple.

When a current is set up in this manner in an acid medium, such as fruits, the hydrogen of the acid tends to be liberated on the more noble metal. As this hydrogen accumulates on the metals, it offers some resistance or back-force toward any further deposition of hydrogen. This is an electrical force designated overvoltage and is expressed in volts. This back-force will never completely stop corrosion, but if it is pronounced it will markedly inhibit corrosion. The back-force or overvoltage on tin is very high, and when tin is exposed alone to fruits, or when it is the more noble of the two metals, the overvoltage or back-force is a pronounced factor in inhibiting corrosion; however, in fruits the iron is the more noble metal and, therefore, the hydrogen accumulates on the iron. Since the overvoltage on the iron is relatively low, corrosion is not markedly interfered with by it.

One of the striking facts which our work has brought out recently is that small amounts of dissolved tin have a marked effect upon raising the overvoltage on iron. This is brought out in Fig. 1, where it is shown that apple pomace has a similar effect. Apple pomace was used as being typical of the components of fruits in general. This ability of small amounts of tin in solution to raise the overvoltage on iron is one of the prime benefits that the tin coating imparts to a can. It furnishes a continuous supply of dissolved tin. The fact that the tin is less noble than iron has an additional influence toward inhibiting the corrosion of the iron through the galvanic current that is

*A more technical report of similar data was given before recent meetings of the American Chemical Society and the American Electro-chemical Society. This appears in *Industrial and Engineering Chemistry*, Vol. 20, p. 1373, 1928.

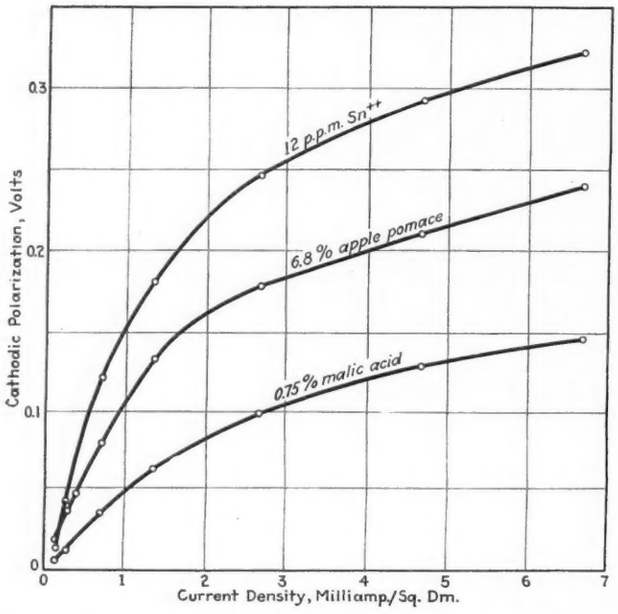


Fig. 1—Dissolved tin and apple pomace have a similar effect on the hydrogen over-voltage (cathodic polarization) on base plate.

set up between the two metals. However, the protective effect which the metallic tin exerts on the iron is at its own expense—that is, the tin corrodes all the more.

Our work indicates that this intensive corrosion of the tin may frequently be the major source of the hydrogen that causes springers and swells. Particularly this is brought out with our work in stainless steel cans. Plain enameled stainless steel cans are not corroded by fruits. The color of cherries and berries is not affected. If these stainless steel cans are tin coated, however—as is the case with ordinary steel in tin cans—and then enameled, hydrogen swells result much more quickly than with ordinary enameled cans. An examination of these cans which have become hydrogen swells shows that there has been marked detinning in the seams and other points where the enamel happens to be broken. This is a condition commonly found in ordinary enameled cans which have become hydrogen swells.

If a can could be devised without a tin coating, in which the same concentration of tin in solution could be maintained on every point of exposed iron, as is accomplished by the tin coat of the tin can, an improved can should result, because the iron, being more noble than the tin, should not corrode so rapidly as the tin in the can now used. Although such conditions can be set up in corrosion tests in the laboratory, it is extremely difficult to apply them practically in the making of a can. It is significant, however, that our corrosion studies have brought out this relationship, and the information thus gained is of tremendous help in the study of the perforation problem.

Unfortunately, the tendency of the tin coat to maintain a certain concentration of dissolved tin is counteracted by another factor. Various components of the fruits tend to throw tin out of solution.[4] The most marked component in this respect is seeds of berries, although the flesh of the fruit likewise has this tendency. When the dissolved tin is thus thrown out of solution or absorbed by the fruit, it is no longer effective in raising the overvoltage on the iron, and thereby inhibiting corrosion.

Table I shows the effect of apple pomace, when added to various acid solutions, on the loss of iron and tin, due to corrosion, both when alone and also when in electrical contact with each other.

Table I—Loss in Weight of Specimens of Base Plate and Sheet Tin 2.5 × 4.0 cm.

Exposed 210 Hours at Room Temperature to Various Acids of Strengths Equivalent to 0.75 Per Cent Malic Acid With and Without Added Extracted Apple Pomace (10 Grams Air-Dried per 140 c.c.) *(a)*.

Acid	Iron Alone in Bottle Mg.	Tin Alone in Bottle Mg.	Iron in Bottle With Tin But Not in Contact Mg.	Tin in Bottle With Iron But Not in Contact Mg.	Iron in Contact With Tin Mg.	Tin in Contact With Iron Mg.
Citric acid:						
Alone	45.6	0.9	6.8	1.0	3.9	1.5
With apple pomace	4.2	2.2	5.0	1.4	1.1	8.4
Malic acid:						
Alone	21.8	1.2	4.0	1.1	4.3	1.0
With apple pomace	3.8	1.2	4.0	1.1	1.7	3.9
Acetic acid:						
Alone	18.5	1.7	9.7	1.1	13.3	0.1
With apple pomace	5.1	0.2	5.2	0.4	10.2	1.2
Malonic acid:						
Alone	60.3	1.3	11.2	1.1	21.9	0.9
With apple pomace	5.1	2.3	5.7	1.9	5.1	2.9
Succinic acid:						
Alone	27.1	1.1	10.3	0.9	18.6	0.2
With apple pomace	3.8	0.4	3.9	0.3	2.8	1.0

(a) In all corrosion experiments the figures represent the average of at least duplicates which check satisfactorily. The figures in Tables III and IV for sulphuric and hydrochloric acid are the average of triplicate experiments.

Table II—Loss in Weight of Specimens of Base Plate and Sheet Tin 2.5 × 4.0 cm.

Exposed 210 Hours at Room Temperature in Acetic Acid Solution Equivalent to 0.75 Per Cent Malic Acid, Without and With Various Additions as Noted Per 140 c.c. Bottle Displacing and Equivalent Volume of Solution

Addition	Iron Alone Mg.	Tin Alone Mg.	Iron in Bottle With Tin But Not In Contact Mg.	Tin in Bottle With Iron But Not In Contact Mg.	Iron in Contact with Tin Mg.	Tin in Contact with Iron Mg.
None	13.2	0.5	7.4	0.3	11.4	0.1
Casein (2 grams)	2.6	0.8	3.0	0.4	1.9	1.0
Hard-boiled egg white (25 grams)	2.1	0.2	2.1	0.1	1.3	0.8
Gelatin (2 grams)	1.5	0.5	1.6	0.3	1.4	1.0
Crushed peanuts (5 grams)	1.5	0.5	1.6	0.1	0.2	2.4
Crushed almonds (5 grams)	1.8	0.4	1.7	0.1	0.0	3.4
Crushed prune kernels (5 grams)	2.6	0.3	3.2	0.3	1.0	2.8

In the first column it will be noted that apple pomace greatly decreases the loss of iron. This effect is due to its raising the overvoltage. By comparing the first and third columns, when no apple pomace was present, it will be seen that the mere presence of the specimen of tin in the same bottle with the specimen of iron materially reduced the loss of iron caused by corrosion. This is the effect of a small amount of tin having gone into solution and raised the overvoltage on the iron. A study of the last column will reveal the fact that the addition of apple pomace in each case increased the loss of tin. This may be ascribed in part to the tendency of the apple pomace to render the tin less noble by absorbing dissolved tin, thereby increasing its corrosion; and it may be ascribed in part to its contact with the more noble iron. An examination of the conditions in acetic acid alone will show that tin when in contact with iron corrodes less than when not in contact with iron. On the other hand, iron, when in contact with tin, corrodes more than when not in contact with tin but in the presence of small amounts of dissolved tin. This shows that in acetic acid tin is more noble than iron, the reverse of the condition in fruits, and in citric and malic acid. In Table II, the same condition is noted with acetic acid alone. If, however, various materials are added to the acetic acid—

materials which have a strong absorptive power for tin in solution—it will be noted that the condition is reversed. All of the materials that were added to the acetic acid in Table II are protein materials. The seeds of berries likewise have a materially high protein content. It is thus apparent that such materials tend to make tin less noble than iron—an important factor in bringing about this condition in canned fruits.

It has long been assumed that the acidity of fruits is a major factor in determining the corrosion. We have previously stated, however, that perforations and hydrogen swells do not develop in proportion to the acidity of the fruit. Some of the least acid fruits, such as black cherries and blueberries, cause the greatest amount of trouble from perforations when packed in enameled cans. A careful examination of Tables III, IV, and V will show that in strong acid solution iron is distinctly more noble than tin, as evidenced by the fact that the corrosion of the tin is enhanced because of being in contact with the iron. In a more dilute solution, however, the condition is reversed. Especially is this brought out in Table V, where it is shown in the weakest acid solution used that the loss of tin per day when not in contact with iron was 0.211 grams, whereas the loss is reduced to 0.046 when the tin was in contact with iron. In contrast to this, corrosion of the iron was increased by being in contact with tin. In the stronger acid, however, the reverse condition obtains.

It was stated that the potential of a metal is a measure of its relative nobility. Figs. 2 and 3 show that the potential of the tin varies with the strength of the acid in which it is exposed, establishing the fact that in the weaker acid solutions tin is more noble than iron, whereas in the stronger acid solutions it becomes less noble.

Thus we have two distinct factors in fruits which tend to render tin less noble than iron: first, the fact that various fruit constituents absorb dissolved tin from the solution; second, a favorable range of acidity that tends to render tin less noble than iron.

Table III—Loss in Weight of Specimens of Base Plate and Sheet Tin 2.5 × 4.0 cm.

Exposed in Sulphuric Acid of Varying Strength at 20 deg. C. *(a)*.

Strength of Acid Per Cent	Period of Exposure Hours	Loss in Weight — No Contact Iron Mg.	No Contact Tin Mg.	Electrical Contact Iron Mg.	Electrical Contact Tin Mg.
20	1	2.0	2.4	0.3	5.9
10	1	1.0	0.3	0.3	2.7
5	1	0.8	0.4	0.3	1.4
1	1	0.7	0.2	0.6	0.7
1	10	5.5	0.9	1.3	2.0
0.5	10	3.9	1.2	2.8	1.0
0.1	10	1.9	1.1	1.9	0.4
0.05	10	1.2	0.7	1.2	0.5

(a) Specimens not in contact were in separate bottles.

Table IV—Loss in Weight of Specimens of Base Plate and Sheet Tin 2.5 × 4.0 cm.

Exposed in Hydrochloric Acid of Varying Strengths at 20 deg. C. *(a)*.

Strength of Acid Per Cent	Period of Exposure Hours	Loss in Weight — No Contact Iron Mg.	No Contact Tin Mg.	Electrical Contact Iron Mg.	Electrical Contact Tin Mg.
20	1	6.6	1.6	0.3	31.4
10	1	1.2	0.6	0.1	6.5
5	1	0.6	0.3	0.1	2.6
1	1	0.5	0.3	0.1	0.7
1	10	2.0	0.5	0.0	2.2
0.5	10	1.5	0.9	0.2	2.6
0.1	10	0.9	0.6	0.4	0.8
0.05	10	1.3	1.2	1.1	0.3

(a) Specimens not in contact were in separate bottles.

Table V—Loss in Weight of Specimens of Base Plate and Sheet Tin 2.5 × 4.0 cm.

Exposed in Hydrochloric Acid of Varying Strengths at 20 deg. C., Containing 10 p.p.m. of Tin as Stannous Chloride *(a)*.

Strength of Acid Per Cent	Period of Exposure Hours	Total Loss — No Contact Iron Mg.	No Contact Tin Mg.	Contact Iron Mg.	Contact Tin Mg.	Loss per Day — No Contact Iron Mg.	No Contact Tin Mg.	Contact Iron Mg.	Contact Tin Mg.
0.05	308	11.6	2.7	12.9	0.6	0.904	0.211	1.005	0.046
0.10	235	23.2	3.2	47.6	0.7	2.369	0.326	4.862	0.072
0.25	139	17.9	0.4	9.2	0.5	3.089	0.067	1.622	0.086
1.0	1	0.4	0.1	0.4	0.5	9.60	2.40	9.60	12.0
5.0	1	0.8	0.3	0.6	1.7	19.2	7.2	14.4	40.8
20.0	1	8.2	2.3	0.8	30.4	196.8	55.2	19.2	729.6

(a) Specimens not in contact were suspended in the same bottle.

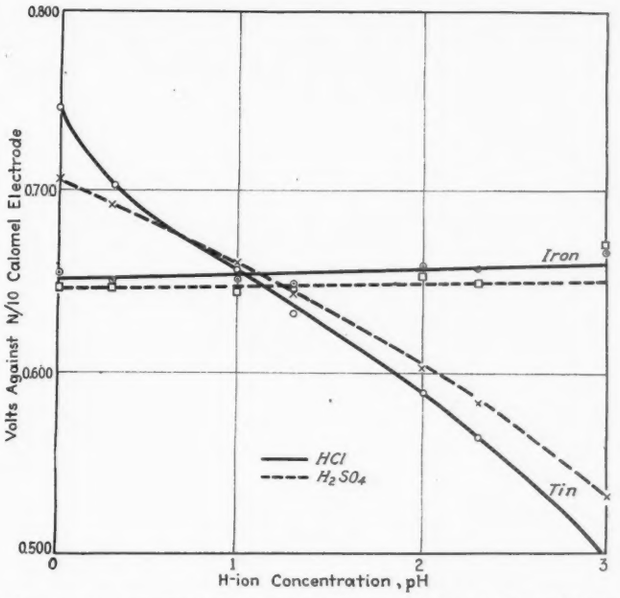


Fig. 2—By comparing the relative potentials of tin and base plate in weak solutions of acids tin is found to be more noble than iron, but at approximately pH = 1 the condition reverses.

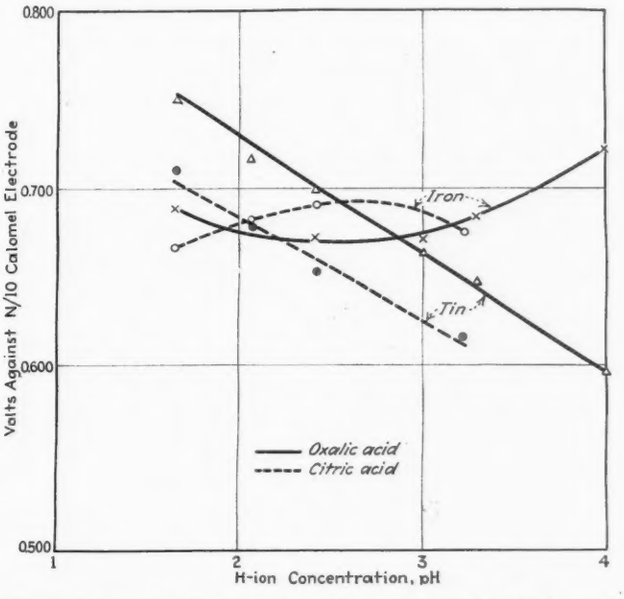


Fig. 3—In weak solutions of oxalic or citric acids tin is more noble than iron, as in Fig. 2, but at pH values between 2 and 3 the condition reverses as before.

References

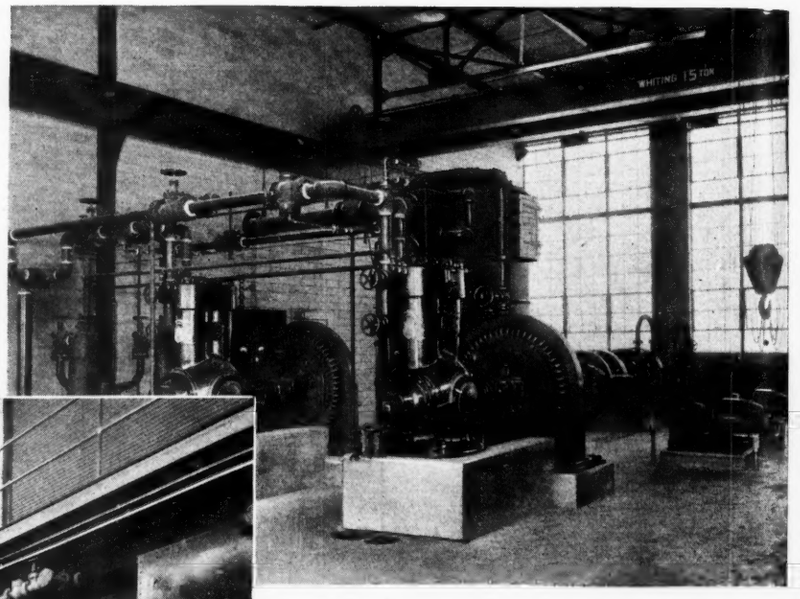
(1) Kohman and Sanborn, *Industrial and Engineering Chemistry*, Vol. 20, p. 76 (1928)

(2) Lueck and Blair, *The Canner*, Vol. 66, p. 23 (1928)

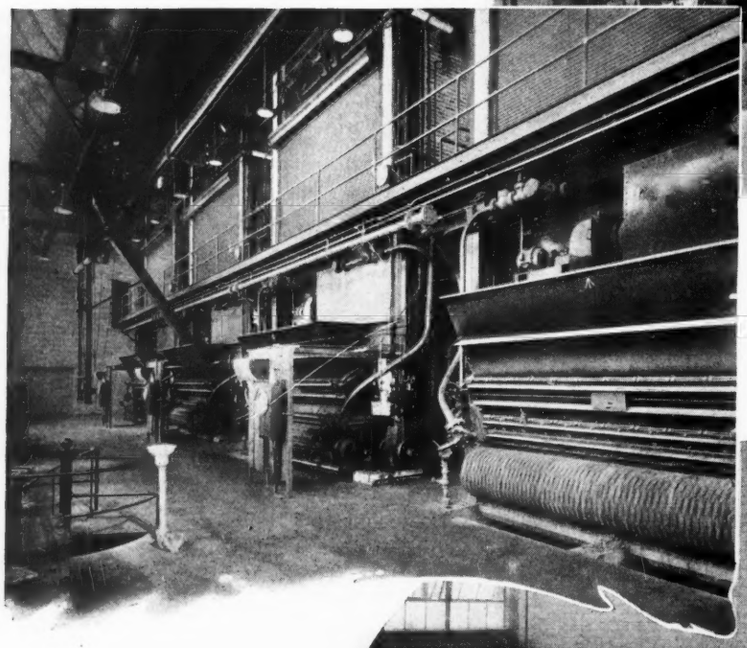
(3) Culpepper and Moon, *Canning Age*, Vol. 9, p. 461 (1928)

(4) Bigelow, *Industrial and Engineering Chemistry*, Vol. 8, p. 813 (1916)

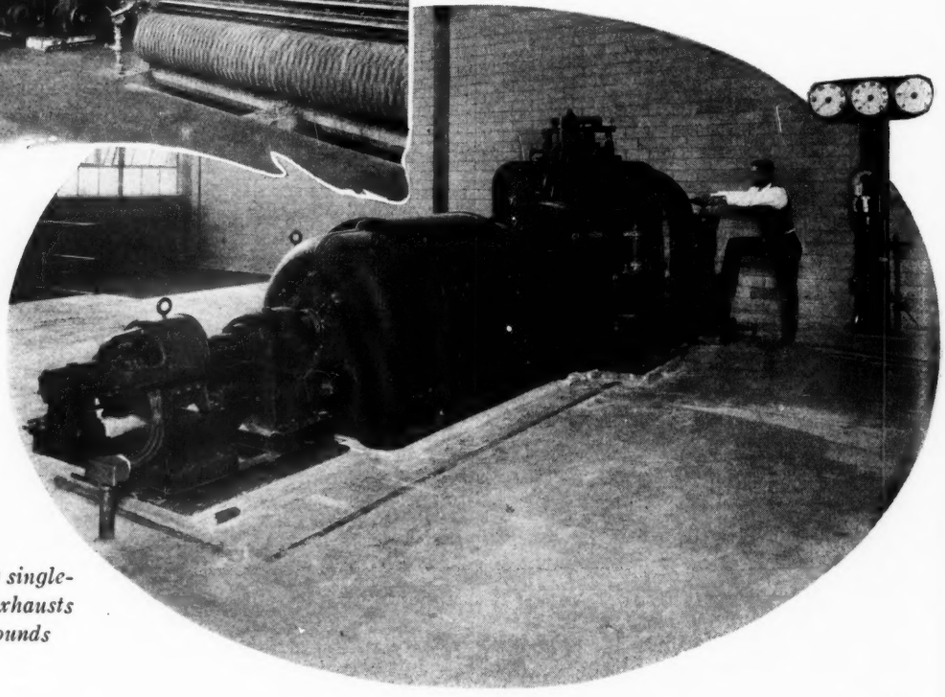
Campbell Soup Company Utilizes the Economies o



Two 50-ton ammonia compressors with open feed-water heater, air compressors and motor-generator sets shown in background



The four boiler units are served by forced-draft chain grates



The non-condensing single-stage turbine unit exhausts to process at 25 pounds

By C. A. SCRIBNER
Engineer, Battey & Kipp, Chicago

es of Byproduct Power

ACCURATE RECORDS covering a period of several years of production at the Camden, N. J., plant of the Campbell Soup Company formed the basis for determining the steam and power needs of the company's new plant just completed at Thirty-fifth and Rockwell Sts., Chicago. Charts plotted from these data showed the day-to-day variation in the demands on the various sources of steam, water, and electricity, one of which accompanies this article and shows the expected steam demand at Chicago for an entire year, expressed in pounds of steam per hour.

Based on the Camden data, the lowest line shows the high-pressure steam demand to operate the turbine-driven power plant; the second line shows the amount of the low-pressure process steam demand; the upper line shows the total amount of the steam demand and includes a certain amount of steam at 100-lb. pressure, as well as the high- and low-pressure steam, The curious drop in steam requirements to virtually nothing in July is explained by the fact that this period, just preceding the tomato season, is the time when all of the plant force except the maintenance department are on vacation.

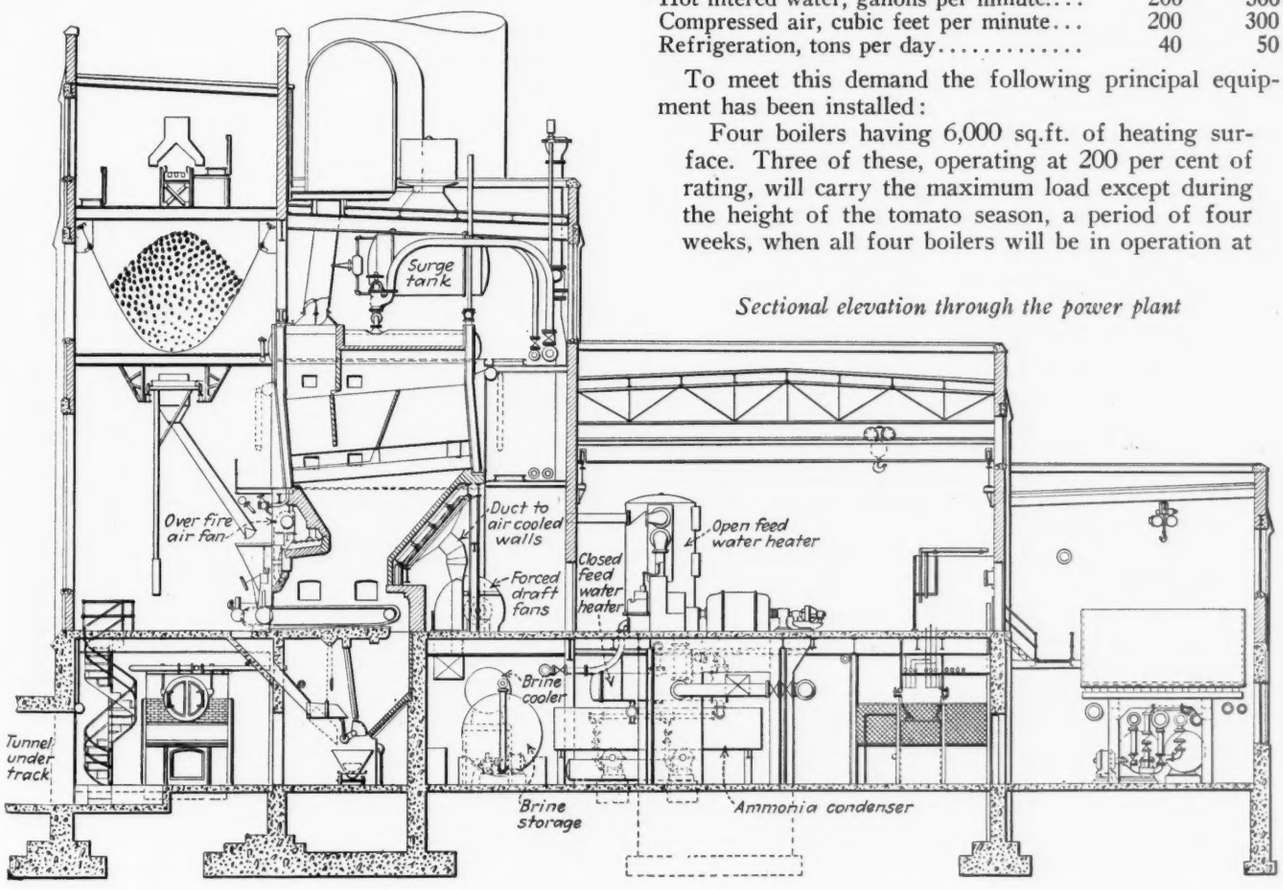
The layout of the new Chicago plant will permit a 50 per cent expansion of manufacturing area and a 25 per cent increase of warehouse space. The first unit, just completed, consists of a six-story manufacturing building, having 400,000 sq.ft. of floor space, a three-story warehouse with 300,000 sq.ft. of floor space, and a power plant. In Table I is shown the significant service-demand data for the first unit, as it now exists, and as it will be when the possible expansion program is completed.

Table I—Maximum Demands for Various Services

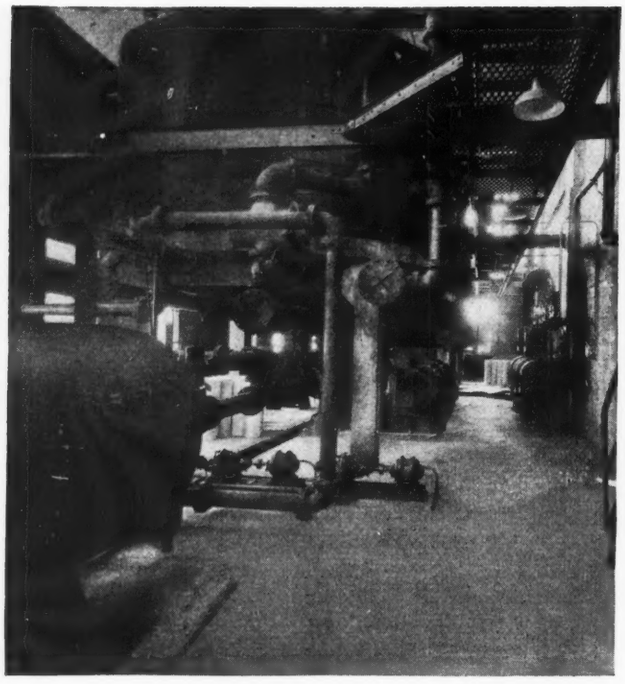
	First Unit	Complete Plant
High-pressure steam, pounds per hour...	107,000	140,000
Low-pressure steam, pounds per hour....	73,000	110,000
Total steam, pounds per hour.....	180,000	250,000
Electric current, kilowatt.....	1,400	2,100
Cold unfiltered water, gallons per minute	2,000	3,000
Cold filtered water, gallons per minute...	750	1,500
Hot filtered water, gallons per minute....	200	300
Compressed air, cubic feet per minute...	200	300
Refrigeration, tons per day.....	40	50

To meet this demand the following principal equipment has been installed:

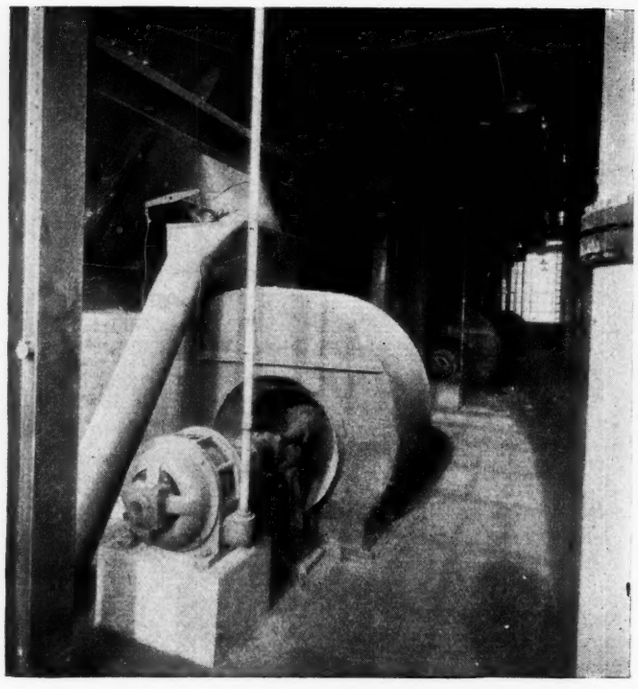
Four boilers having 6,000 sq.ft. of heating surface. Three of these, operating at 200 per cent of rating, will carry the maximum load except during the height of the tomato season, a period of four weeks, when all four boilers will be in operation at



Sectional elevation through the power plant



Filter room containing three gravity filters, pumps and storage-type service water heaters



Forced-draft fans and connections from main air duct under floor to air-cooled boiler walls

PRINCIPAL EQUIPMENT IN NEW POWER PLANT OF CAMPBELL SOUP COMPANY, CHICAGO

Boilers, four 6,072 sq.ft. Edge Moor.
Steam pressure, lb. gage, 225.
Boiler Setting, Alert type; bottom front header 14 ft. above floor; Detrick air-cooled arches and side rear walls; Maroney firebrick above furnace; "Flame Brand" high-temperature cement; steel casing lined with Sil-O-Cel brick; Vastine observation doors; Diamond "Valv-in-Head," 6-element soot blowers.
Boiler Fittings and Accessories, Consolidated safety valves; Everlasting tandem blowoff valves; Golden-Anderson triple-duty non-return valves; Ashcroft steam gages; Reliance water columns; Hagen steam purifiers, 3 per boiler.
Refuse burning boiler, one Union Iron Works 2-drum universal fire tube, 1,000 sq.ft., shaking grates, 25 lb. pressure.
Stokers, 4 Green (Combustion Engineering Corp.) forced-draft chain grates, 144 sq.ft., pressure water backs and side-wall water boxes.
Stoker engines, 4 Troy, 4x4-in., with Pickering governors.
Fans, forced-draft, four 25,000-c.f.m., Sturtevant turbo-vane, driven by 25-hp. General Electric induction motors.
Fans, overfire air, four 3,500-c.f.m. Sturtevant multivane, driven by 5-hp. General Electric induction motors.
Chimney, one 250x12 ft. Alphons Custodis radial brick.
Breeching and forced-draft ducts, Connery & Co.
Combustion control system, Brooke Engineering Corp.
Feed-water heater, open, one 150,000-lb. per hour Milwaukee Reliance Boiler Works.
Feed-water heater, closed, one four-pass Griscom-Russell horizontal, 1,110 sq.ft.
Heaters, service water, 2 U-tube, Griscom-Russell, storage type, 130 g.p.m. from 60 to 200 deg. F.
Filters, 3 gravity type, 600 g.p.m. International.
Boiler-feed pumps, 2 American centrifugal, 400 g.p.m. against 300 lb. head, driven by 150-hp. G. E. single-stage turbines.
General service pumps, 4 American centrifugal, 1,000 g.p.m., against 170 ft. head, driven by 75-hp. G. E. syn. motors.
Hotwell pumps for h.p. drips, 2 American centrifugal, 200 g.p.m., against 50-ft. head, driven by 5-hp. G. E. ind. motors.
Hot-water circulating pumps, 2 American centrifugal, 30 g.p.m. against 40-ft. head, driven by 2-hp. G. E. motors.
Fire pump, 1 Dayton Dowd, centrifugal, 1,500 g.p.m., driven by a 15-hp. Standard turbine.
Brine-circulating pump, American centrifugal, 300 g.p.m. against 60-ft. head, driven by a 15-hp. General Electric motor.

Refrigerating Equipment

Ammonia compressors, two Baker 50-ton single-acting, double-cylinder, driven by G. E. 100-hp. syn. motors.
Brine coolers, 2 Vogt hor. shell-and-tube type.
Brine storage tank, one 8x16 ft.; one brine mixing tank, 200 gal.; one double-pipe condenser; two ammonia receivers, Burge Ice Machine Co.
Air compressors, two single-stage Sullivan, 200 cu.ft. per min., 125 lb., belt driven by G. E. 50-hp. syn. motors.
Coal and ash handling, apron feeder, swing hammer crusher, bucket conveyor, belt conveyor and tripper, 60 tons per hour capacity; ash feeder and 27-cu.ft. ash car; one-ton electric weigh larry, Jeffrey Mfg. Co.
Ash hoppers, Beaumont, brick lined, with gates under stokers; 70-ton per hour drag scraper equipment.
Turbine-generator, one 1,000-kw. Westinghouse noncondensing, 225 lb. initial and 25 lb. back pressure; direct-connected exciter.
Generator air cooler, Griscom-Russell fin type.
Oil filter, S. F. Bowser & Co.

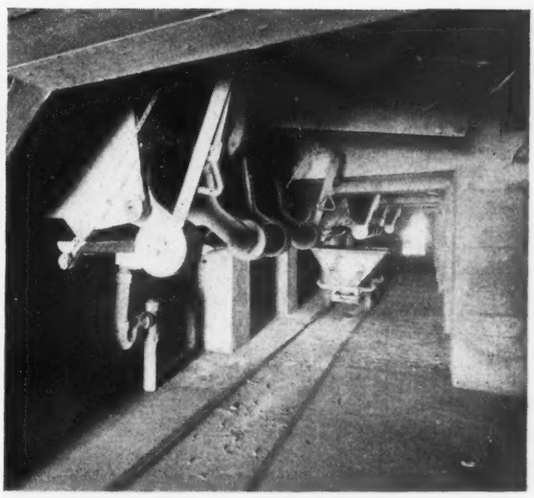
Electrical Equipment

Switchboard.....Chicago Switchboard Mfg. Co.
Indicating meters.....Weston Elec. Inst. Corp.
Graphic instruments.....Esterline-Angus Co.
Circuit-breakers.....I. T. E. Circuit Breaker Co.
Transformers, 3 single-phase, 300 kva., 440 to 220-110 v., Pittsburgh Transformer Co.
Motor generators, two 16-kw.....General Electric

Miscellaneous Equipment

Crane, one, 15-ton hand.....Whiting Corp.
Grating, "Subway".....Irving Iron Works Co.
Piping wrought iron.....Reading Iron Co.
Pipe covering, 85 per cent magnesia, Johns-Manville Corp.
Fabricated pipe.....Midwest Piping & Supply Co.
Valves, gate.....Chapman Valve Mfg. Co.
Valves, globe.....Walworth Co.
Valves, back pressure.....Cochrane Corp.
Valve, non-return on turbine, wing type, G. M. Davis Reg. Co.
Valves, reducing.....Leslie Co.
Traps, steam.....Illinois Engineering Co.

The coal pocket is supplied from railway cars or from storage by means of a drag scraper



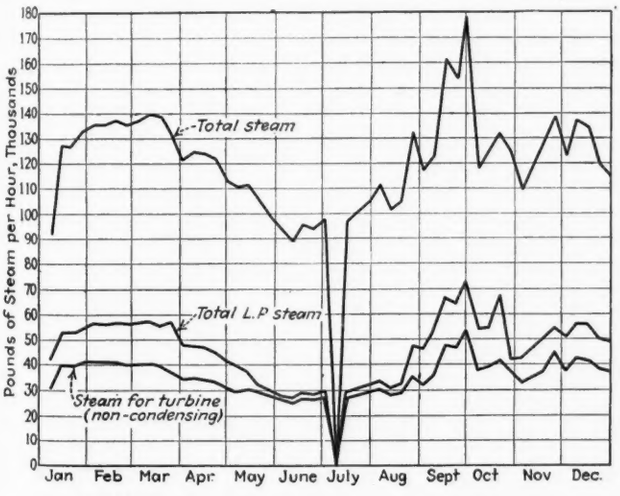
Ash hoppers, equipped with inclined overcut gates and industrial ash car

225 per cent of rating. They will carry 225-lb. steam pressure.

One refuse-burning boiler, 1,000 sq.ft. surface, to generate steam at 25-lb. pressure.

One 1,000-kw. non-condensing turbine-generator, operating on steam at 225-lb. pressure, and exhausting against 25-lb. back pressure.

Analysis of the several means of supplying electricity to the plant indicated as most economical the installation of one turbine-generator of 1,000 kw. and a public service connection to operate in parallel with this power unit. The turbine-generator will be operated to capacity, or in case a capacity demand for process steam at 25-lb. pressure is lacking, it will be operated up to the demand for exhaust steam, and the public service will carry the remainder of the load. Also, the public service will supply the stand-by.

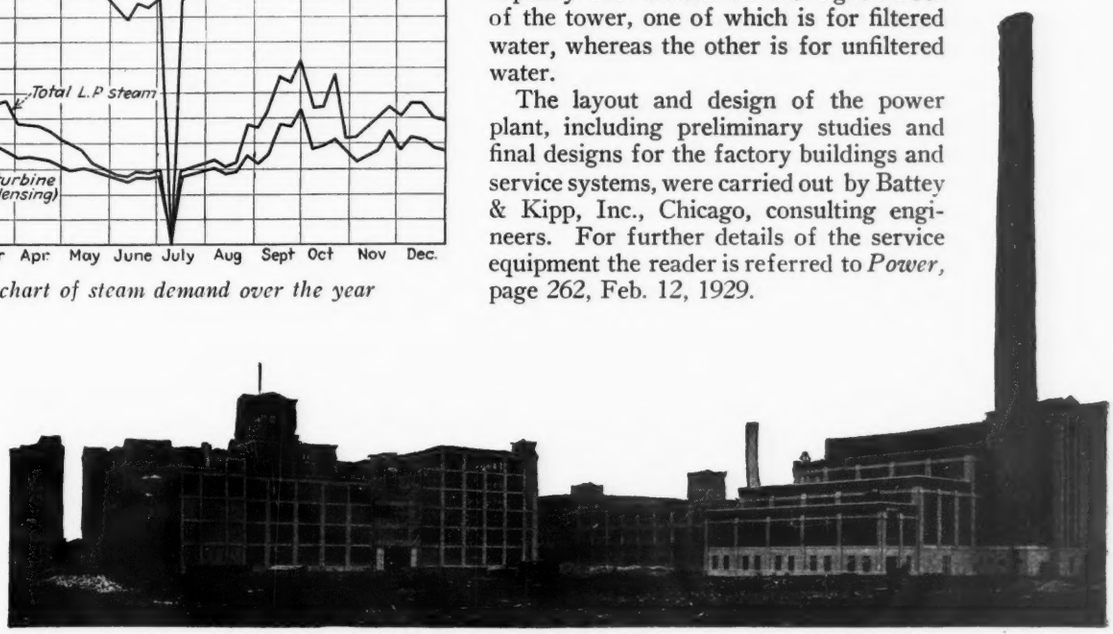


Typical chart of steam demand over the year

During all periods of the year there is more demand for steam at 25-lb. pressure than the exhaust from one or more back-pressure turbines would supply, even if they were carrying the entire electric load. At night during the summer this condition does not hold, but the electric load will be carried by public service during these hours. To make up the difference between the demand for process steam and the amount provided by the turbine-exhaust and that provided by the refuse-burning boiler, steam from the high-pressure mains will be brought down to 25-lb. pressure through reducing valves. Process steam is used for heating the building and water, sterilizing, cooking, and for a closed-type feed-water heater.

Chicago water, drawn from Lake Michigan, is often clouded with very fine particles of sand, particularly after prolonged and severe storms, a fact that is well known to all residents of the city. This has necessitated the use of extensive filtering equipment at the new plant. Three 15-ft. gravity filters are required, each having a capacity of 600 gal. per minute. Two tanks of 25,000-gal. capacity are located on the eighth floor of the tower, one of which is for filtered water, whereas the other is for unfiltered water.

The layout and design of the power plant, including preliminary studies and final designs for the factory buildings and service systems, were carried out by Battey & Kipp, Inc., Chicago, consulting engineers. For further details of the service equipment the reader is referred to *Power*, page 262, Feb. 12, 1929.



Peroxides in the Cereal Industries

By G. Van der Lee

The Novadel Laboratory, Noury & Van der Lande. Deventer, Holland

ONE of the most striking examples of the penetration of refined chemical methods into all branches of industry doubtless is the introduction and extensive use of peroxides in the cereal industries. Benzoyl peroxide, some years ago known only to a small number of chemists and familiar to hardly anyone of them, nowadays is used continuously by the larger part of the millers, not only in the United States but in all countries of the world. Perhaps only few of them are aware of the chemical principles underlying its use, and the purpose of this paper is to give a short explanation of the scientific background of the technical application of this remarkable substance.

BENZOYL peroxide, prepared in a special way, is used under the trade name "Novadelox" for the bleaching of flour, more especially wheat and rye flour. What is bleached in flour—what colored substances disappear by the action of the bleaching agent? Flour contains a small quantity of oil that can be extracted by the usual solvents for oils and fats, the same liquids that are applied for the extraction of oils from seeds.

Gasoline, carbon tetrachloride, ether and some other materials of the same chemical group may be used. After evaporation of the solvent a yellow oil remains, in which the greater part of the coloring matter of flour is contained. This is true of the high-grade patents only; extracted clear flour has a gray, dull color, caused by branny fragments that are always present in the lower grades.

This picture of the nature of the color of flour is schematic and rather rough. In treating flour with gasoline not only the pigment in the flour oil is dissolved, but also the highly dispersed particles of coloring matter inclosed between the protein and the starch. These minute fragments of pigment are also taken up by the solvent and find their way in the oily extract. When in the following lines, for the sake of simplicity, I include all these sources of coloring matter and discuss the bleaching of the oily extract the reader should keep in mind the fact that in reality a somewhat more complicated process is taking place.

THE yellow pigment in the oily extract has been identified as carotin, the same substance that gives the color to carrots. The amount of carotin in the oil is extremely small, varying in the different types of wheat between 0.01 and 0.02 per cent. As the oil content of flour is about 1 per cent, carotin occurs in flour in quantities from 0.0001 to 0.0002 per cent. It is this minute amount of coloring matter that puzzles the miller and for the removal of which he installs his bleaching equipment. To bleach flour, it is necessary to destroy the carotin as such and to convert it into a colorless substance. Fortunately, this is not so difficult, as carotin is a very delicate and unstable substance that easily combines with active chemical reagents. The weak points in the carotin body are the unsaturated linkages in its molecule, atoms of carbon not fully saturated by hydrogen atoms. These carbon atoms are looking for some other atoms to occupy the free place. Oxygen atoms can satisfy this desire; by reacting with active oxygen the unsaturated carotin is converted into a stable carotin-oxygen compound. And this is the principle of flour bleaching: carotin is yellow; the combination of carotin with oxygen is colorless. The way to bleach flour is therefore to add oxygen to the carotin; in other words, to oxidize the carotin.

PEROXIDES, as is indicated by the name, contain oxygen; the first syllable, moreover, shows that there is an excess of this element. In common with the unsaturated compounds with a shortage of atoms in their molecule, they are not stable; the peroxides, having an excess of atoms (in this case of oxygen), react very easily with other substances. By bringing the peroxides containing an excess of active oxygen in contact with unsaturated compounds, eager to become saturated, a chemical reaction takes place: the peroxide loses its oxygen, which combines with the unsaturated compound. In chemical terms: carotin, the coloring matter of flour, is oxidized by benzoyl peroxide to a colorless oxidation product.

From chemical calculations, a description of which is not germane to this discussion, it follows that theoretically 0.0005 to 0.001 grams of benzoyl peroxide can bleach the carotin present in 100 kilos of flour. In practice twice to three times as much is used, because part of the peroxide combines with other flour constituents.

However, I should point out that benzoyl peroxide, like other bleaching agents, is rather specific in character. Carotin is converted into a colorless product, but other pigments are attacked much less effectively, or are not even attacked at all. In the patent flours carotin is practically the only coloring substance. In the dark flours and feeds, in addition to carotin, very resistant pigments are present, originating from bran particles that are introduced into these products. These brown bran pigments are not decomposed or converted into colorless compounds as is the carotin, and this is the reason why low-grade flours cannot be bleached to a pure white. On the one hand, this is an advantage, for in existing practice bleaching cannot be used to hide the real quality of these inferior types of flour.

ONE of the most interesting and at the same time most astonishing features in this bleaching process is that it is founded on a chemical reaction between a solid substance, the peroxide, and a colorling matter dissolved in a liquid, which is dispersed in a large mass of a powdered substance, the flour. How do the tiny peroxide particles reach the small fat globules? Probably the peroxide volatilizes to some extent after the mixing with the flour: the peroxide vapors find the oil droplets and dissolve in the latter. In this oily medium the chemical reaction between benzoyl peroxide and carotin takes

place, resulting in a bleaching of the yellow coloring matter. From the foregoing considerations it will be clear that an intensive mixing of the flour with the bleaching agent is essential, a factor which is carefully observed in the practical application of the peroxide bleaching process.

No matter how intimate the mixing may be, the volatilization of the peroxide, its dissolution in the oil, and the chemical reaction with the carotin will require some time. Immediately after the mixing of the peroxide with the flour no significant bleaching action is observed. After some hours the decolorizing starts, and in 24 hours the bleaching is finished. The higher the temperature the quicker the action. In a hot climate or with flour coming hot from the rolls some hours less are sufficient to complete the bleaching.

BASED on a thorough study of the theoretical background, a system was developed for the commercial use of benzoyl peroxide in the cereal industries. At first it was found necessary to mix the peroxide with some other substance to facilitate the incorporation of such a minute amount of the active reagent with the flour. If pure peroxide were used it would be very hard to feed it regularly and continuously to the flour stream, and still harder to distribute it evenly in the flour. Moreover, the danger that the peroxide loaded with active oxygen would decompose spontaneously had to be avoided. After a careful examination of numerous substances a particular form of a calcium phosphate was found to give satisfactory results in all respects. The commercial product, sold under the trade name "Novadelox," therefore is an intimate, finely powdered mixture of benzoyl peroxide and a calcium phosphate, one pound of which will bleach 7,000 to 15,000 pounds of flour, according to the grade of the flour and the degree of bleaching required. The higher the grade—that is, the lower the ash content—the smaller the amount of carotin present and the less "Novadelox" is necessary. Moreover, the personal opinions concerning the desired color in flour vary enormously; in some countries, like the United States, a very white color is preferred; in other parts of the world a distinct slightly yellow hue is liked most.

That the system allows bleaching to any required degree by simply altering the added quantity of the powder is one of its strong points of the new process. The addition of such small quantities of "Novadelox"—namely, $\frac{1}{4}$ to $\frac{1}{2}$ oz. to a barrel of flour—created a need for an apparatus that could accomplish this without continuous supervision. For this purpose a machine known as Novadel feeder was built. The feeder is mounted on a flour conveyor in which the powder is preliminarily mixed with the flour. To get an even distribution of "Novadelox" in the flour, required for an efficient and economical use of the peroxide, a further mixing in some kind of agitator can be recommended. If the powder is added to the flour in the stream, sometimes the mixing in the various operations in the milling process is sufficient and no special agitator is required.

The upper part of the feeder is the hopper for the "Novadelox," in which a special stirring arm is moving to keep the powder in a loose condition. This hopper has a small aperture at the bottom through which the powder falls in a horizontal cylindrical tube wherein a screw conveyor brings it to the outlet. The latter is connected with the flour conveyor.

PERHAPS after reading this description of flour bleaching as an oxidation process, the question may arise whether oxygen in the atmosphere could not perform the bleaching action as well. The answer is that flour is indeed bleached to a small extent by exposure to the air. This natural bleaching, also called aging or maturing of flour, has been known to millers for a long time. Formerly it was applied to a considerable extent by storing the flour for several weeks before selling it. However, as the oxygen in the air is in an inactive state, a much less intensive bleaching was obtained, even after prolonged contact. For this reason the fact that chemistry has developed a method to intensify the oxidizing power of the atmospheric oxygen by converting it into a solid compound, from which it is easily released in an active form, may be considered as a long step forward. The uncontrollable and time-consuming aging and maturing of flour by nature thus has been superseded by a safe, rapid, and far more effective process based on scientific principles.

Casein Assuming Important Position in United States Trade

CASEIN is rapidly assuming an important position in United States trade, according to the U. S. Department of Commerce. Production as well as imports of casein have more than doubled within the last decade. Figures by J. N. Taylor, of the chemical division of the department, reveal that over 18,000,000 lb. were produced in the United States in 1927, more than twice the 8,000,000-lb. output in 1928. At the same time imports have jumped from 12,000,000 to 27,000,000 lb. making casein the fourth largest among chemical raw materials imported.

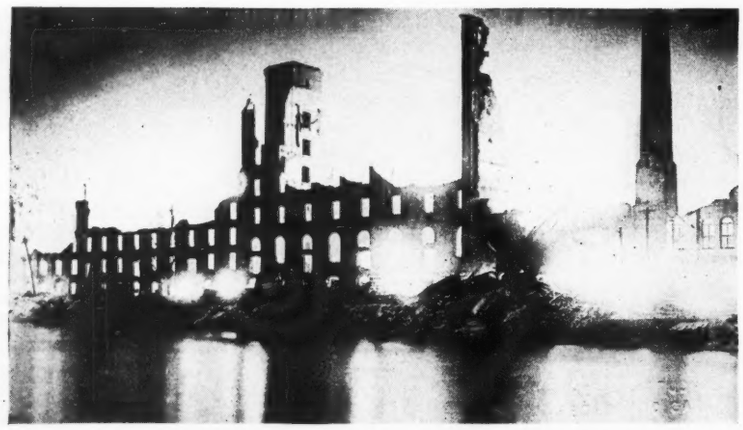
Casein (lactarene) is, chemically, a protein found in milk in the form of calcium caseinate, and, consequently, is capable of preparation in any part of the world where the milk of mammals is obtainable. A form of casein is now produced in Japan from the soy bean. Casein is used in the paper, printing, lithographing, electrotyping, and publishing industries, and as an adhesive in the manufacture of plywood veneer products.

During the World War, as a waterproof adhesive of great strength, its use was developed in making airplane propellers. A special grade of hardened casein, known under various trade names, is used in making a wide variety of articles such as buttons, combs, umbrella handles, brush backs, and cigarette holders. Casein is also employed as an ingredient of spraying insecticides and waterproof paints and as a diabetic food, and increasing quantities are demanded in the manufacture of wall paper.

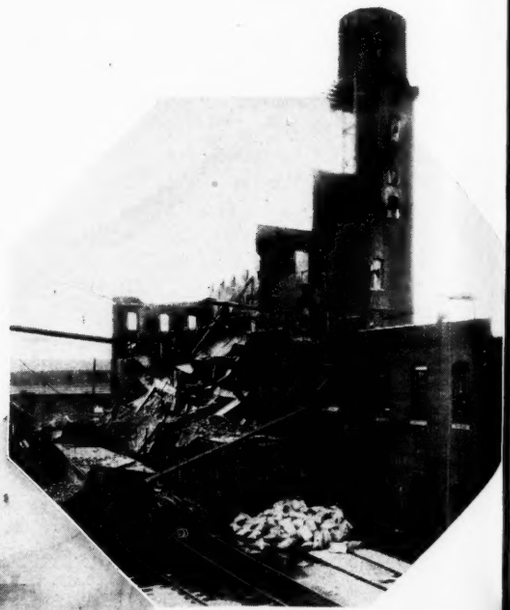
For the manufacture of casein, the chief raw material used is skimmed milk, which contains, besides casein, albumen, milk sugar, and certain salts. Preparation of the casein is accomplished in one of four different ways: (1) The natural method, allowing the milk to sour until the casein is thrown down; (2) by lactic acid; (3) curding by the addition of a mineral acid; and (4) through rennet precipitation. The curd is then washed with water, pressed, dried, and ground.

Prevention *and* Contro

Marked progress has been made by the Chemi Wash Engineering Division of the Bureau of Chemist, engin and Soils, United States Department of Agric ures ap

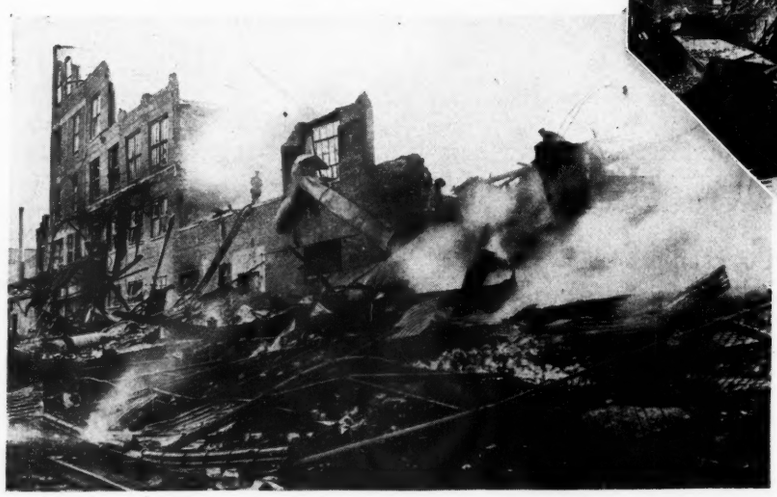


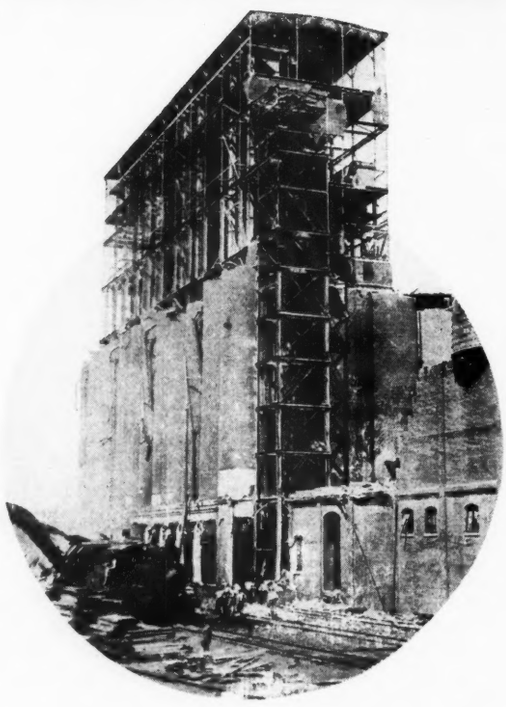
Grinding of oat products evidently caused this disaster, with seventeen deaths, sixteen seriously injured and $2,000,000 property loss



Above—Another million dollar loss

At right—Salvage possibilities are obviously zero in this corn-pulverizing, dust-explosion exhibit



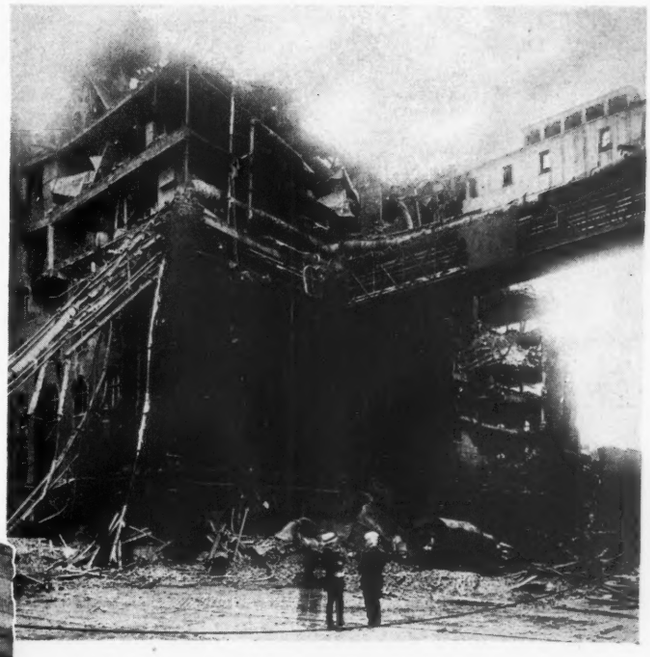


Remote and seemingly minor hazard causes extensive damage. An unprotected electric-light bulb in the basement, broken by a push-broom handle, wrecked this structure, fourteen deaths and ten serious injuries resulting. An outer globe with suitable heavy wire guard of negligible cost would have saved half-million dollar loss

Inert gases can afford protection against hazards of grinding operations. By reduction of oxygen content in atmosphere of grinding and conveying equipment explosions are prevented, even though grit, metallic particles, broken parts, static charges, or other sources of spark or flame may be encountered. Flue-gas and air mixtures of controlled oxygen content are usually readily and most cheaply applied.

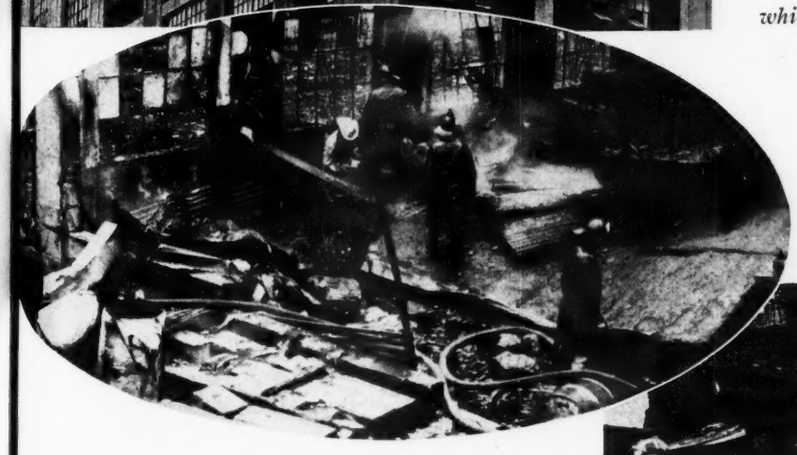
trof Dust Explosions

Chemi Washington, D. C., under the direction of David J. Chemist, engineer in charge, in the development of effective f Agric ures applicable in the food industry.



Photos are published by courtesy of Mr. Price, who will co-operate with industrial managements in the study of new problems and development of hazard preventing measures

Explosion venting saves structure. Large glass areas of modern factory construction localized an explosion by automatic venting of the pressure developed as is shown at the left, a result which is not possible in older types of construction, which suffer as is illustrated above



New lines of industry must take special precaution.

Above—Spray drying, vapor handling, and dusty atmospheres invariably demand that the progressive management determine where hazards exist and how economically to achieve safety without imposing impractical operation conditions. Loss of twenty lives resulted here from unrecognized hazard in a new type of manufacture.

Right—Dust from spraying operations in a new line of industry caused the search for bodies here shown

MECHANICAL STABILIZATION OF EMULSION

in Dairy Manufacture

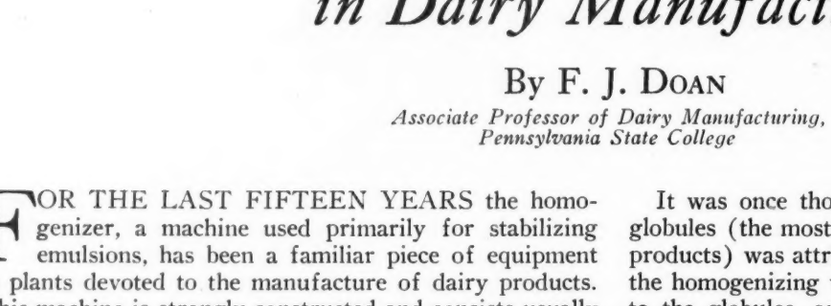
By F. J. DOAN

Associate Professor of Dairy Manufacturing, Pennsylvania State College

FOR THE LAST FIFTEEN YEARS the homogenizer, a machine used primarily for stabilizing emulsions, has been a familiar piece of equipment in plants devoted to the manufacture of dairy products. This machine is strongly constructed and consists usually of three or six pistons, operating in succession by means of properly constructed shaft eccentrics, which force the product in process of homogenization through small, almost microscopic, openings under great pressure. In dairy uses the pressures range from 500 lb. to 4,000 lb. per square inch, depending on the product and the results desired. Pressure can be controlled by adjusting the size of the aperture through which the product passes. The volume of material delivered by the pistons being practically constant, the pressure increases as the size of the aperture decreases, and the velocity of the product passing through also increases.

The effect of homogenization manifests itself as the product passes with great velocity through the minute opening (or openings) from a region of high pressure to one of low pressure. The small opening is usually known as the homogenizing valve. These valves are generally two ground surfaces that seat accurately upon each other in the form of an ordinary drop and lift valve. The distance between the ground surfaces is regulated by a large screw, supplemented by a heavy spring. Turning the screw down closes the valve, and raising it opens the valve.

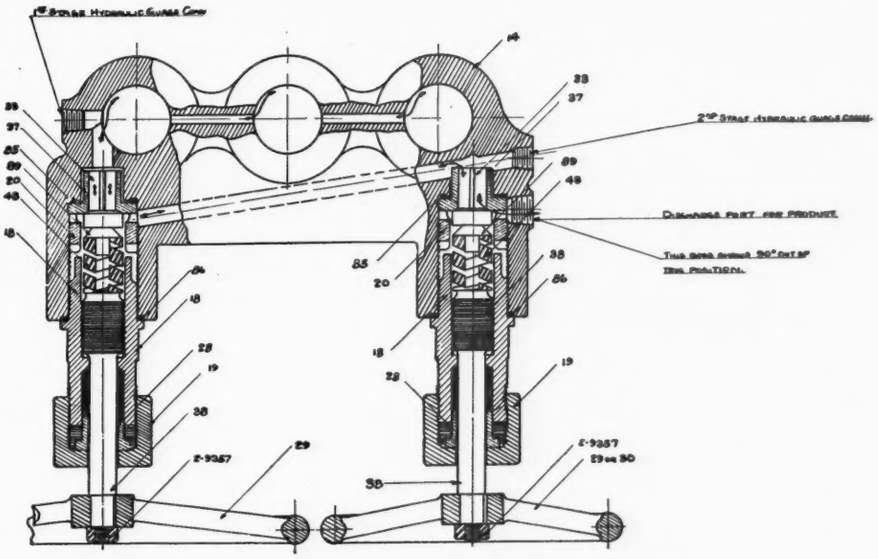
It was once thought that the breaking up of the fat globules (the most familiar effect of the process on milk products) was attributable to the fact that the opening in the homogenizing valve was too small to permit passage to the globules, and that as they were forced through they were of necessity broken up into fragments. At present, however, this is not usually considered to be the explanation, it having been found that under operating conditions the valve surfaces are from 0.003 to 0.01 in. apart and average fat globules measure in the vicinity of 0.0001 in. in diameter. Thus whole globules, and even clusters of globules, could pass unaltered if space only was a factor.



Battery of homogenizers in the plant of the Luick Ice Cream Company of Milwaukee

There are apparently two possible factors that have a part in the breaking up of the fat globules into from 10 to 100 fragmentary globules: First, the very great velocity with which the product passes through the restricted opening creates a shearing force that tears the globules apart; second, the force with which the product impinges on the wall of the valve head causes an atomizing effect, which further subdivides the globules. The first factor can be regulated by adjustment of the homogenizer valve opening. It is an easily demonstrated fact that as the valve is seated closer and the pressure rises, the effects of homogenization become more pronounced. The second factor cannot be controlled by the operator so completely as the first. This factor depends more on the construction of the homogenizing head. The force with

which the product strikes the wall of the chamber surrounding the homogenizing valve, and therefore the atomizing effect, depends on the velocity of the material, the nearness of the wall to the valve, and the angle of impact. Of these only velocity can be controlled, and it has an effect all its own. Regarding the angle of impact, the greater this is the greater will be the atomizing effect—which means that the ground surface of the homogenizing valve should be as nearly at right angles to the adjacent wall as possible if maximum results under given conditions are to be obtained. No exhaustive investigation of these factors affecting the efficiency of homogenization has been made, but enough data have been collected to confirm the writer's opinion. Many later models of homogenizers are equipped with two homogenizing valves, arranged in series. Each of these can be set separately as desired. For certain purposes this two-stage homogenization is much superior to the single-stage "effect." In dairy uses the prime advantage of such an arrangement of valves is that more efficient subdivision of the fat is obtained without the customary increase in viscosity. Viscosity, in fact, can be controlled almost to any desired degree by adjusting the opening of the second valve. In two-stage homogenization, of course, the pressure built up between the pistons and the first valve represents the sum of the effect of both valves. The homogenizing effect of the first valve is approximately the difference between this high pressure and the pressure between the first and second valves.



Homogenizing valve assembly, showing a two-stage National Equipment set up and details of the homogenizing head

Homogenizers have a great variety of uses in the food industries, being almost indispensable in the preparation and processing of mayonnaise dressings, chocolate sirups and sirups in general for bottling uses, certain mixes in the baking industry, and many preparations used in making various confections. The varied uses of the machine are continually being added to as more and more products are found to be capable of improvement by homogenization.

In the dairy industry the homogenizer is used to stabilize the fat emulsion in dairy fluids, prevent churning tendencies, and increase the viscosity. All these effects are dependent primarily on a subdivision of the fat globules. The machine is also used to improve the texture of products that are somewhat coarse owing to some form of casein coagulation.

The uses of the homogenizer in the processing of various common dairy products will now be considered.

Ice Cream

In the ice cream industry, more homogenizers are used than in all other dairy products combined. It is almost universal practice to homogenize the entire mix from which the finished product is frozen. As the result of numerous experiments it has been shown that the processing of the ice cream mix, in this manner, produces an ice cream smoother in texture, more uniform in "body," of richer flavor, and less prone to develop "iciness" when held in the hardening room, than is the case when the mix is not homogenized, or when only the cream is homogenized. The latter, method, however, is better than no homogenization at all. Homogenized mixtures never show evidences of churning in the freezer. They whip with greater ease, and more completely, diminishing the freezing time considerably; furthermore, they often require no aging, which almost invariably improves the freezing properties of unhomogenized mixes.

Two-stage homogenizers are becoming popular in ice cream plants, for the reason that high pressures—and therefore complete homogenization—can be had without the development of undesirable viscosity, which not only slows down the freezing process but makes handling more difficult.

The benefits imparted by the homogenizer are undoubtedly closely connected with the breaking up of the fat globules and the consequent stabilizing of the fat emulsion. The way in which this phenomenon explains all the benefits, however, is not entirely understood, and much fundamental research on the subject is still possible.

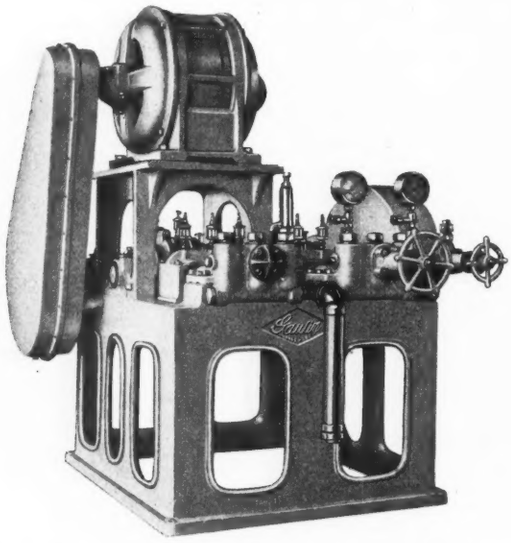
It has been shown that when enough fat is present in the mix (or in other fluid products), the homogenizing process not only subdivides the fat globules but causes these created small globules to cluster or form clumps. This fact helps to explain the increased viscosity of the homogenized material. When two-stage homogenization is practiced, the second valve seems to disperse the clumps formed by the first valve, giving the operator control of the viscosity to a remarkable degree and at the same time assuring thorough homogenization by allowing a close setting of the first valve.

Market Milk

Bottled milk for household consumption is not homogenized in this country, owing to the fact that such processing destroys the creaming ability of the milk; nevertheless, the sale of homogenized milk is quite common in many Continental cities, and at least one milk dealer in Canada is homogenizing his output. The benefits of homogenized milk, if any, are that the product stays homogeneous—the fat content of the under layers being always the same as the upper—and that for infants

and invalids the fat may be digested more easily, owing to the smaller sized globules.

Whole fluid milk, sold wholesale to confectioners and bakers, is often homogenized, the processed article having been found distinctly superior to normal milk for some uses.



Six-cylinder, two-stage Manton-Gaulin valve homogenizer, equipped with two pressure gages

By means of homogenization, powdered skim milk and butter, or powdered skim milk and cream, can be mixed with water and a reconstituted milk produced. During the late war one of the munition towns that grew up over night and lacked a milk supply was furnished this form of milk. The milk was reconstituted from fresh sweet butter, fresh skim milk powder, and water. It was pasteurized, bottled, and distributed in the usual way, and the operators were even able to give the product creaming ability by homogenizing the fat with only a portion of the powder and water, later adding this to the balance of the necessary ingredients. This was, of course, owing to the fact that fat clumps were formed by the homogenizer when comparatively rich mixtures of fat were processed. These clumps rise to the surface, whereas single globules will not rise.

Table cream can also be made in a similar manner by using more fat and less water and milk powder. Whipping cream is not capable of being made in this way.

"Viscolized" Milk

The homogenizer is thought of as being—and it is—an emulsion stabilizer; and yet peculiarly enough it has been used for the purpose of enhancing the amount of cream that rises on bottled milk. At first glance this statement may appear contradictory, considering what has been said previously about homogenized milk; nevertheless, it is true that if a portion of a lot of whole milk is separated and the cream homogenized and then returned to the original lot together with the skim milk, the cream rising on this mixture will be greatly increased in volume over that which would have risen normally.

The explanation of this phenomenon is simple: Homogenizing a product rich in fat (cream) creates clumps of the small globules produced by the process. These clumps will rise, whereas individual small globules will not rise, and since these clumps are rather irregular and not at all compact, they tend to pack loosely in the cream layer, giving cream of greater volume and less richness.

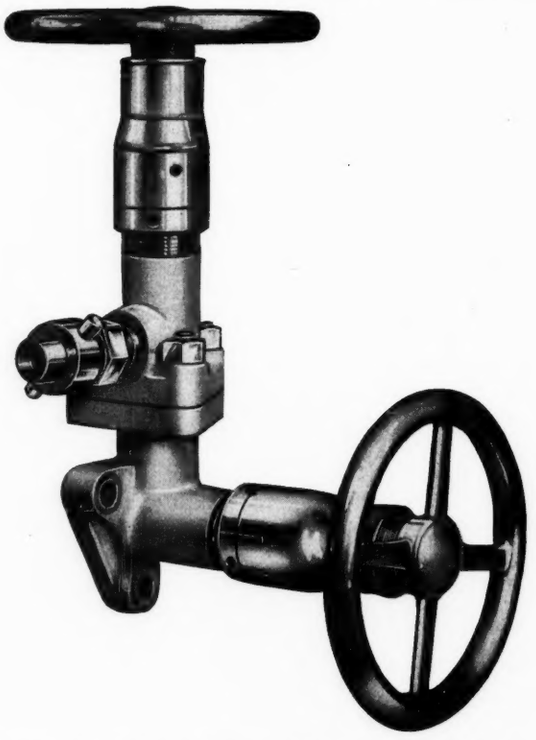
This process was patented and the rights were sold to dealers by the patentee until the federal officials prosecuted and obtained verdicts.

The detection of such milk is a simple matter (as shown in an investigation conducted by the writer), the fat clumps due to homogenization being readily identified by ordinary microscopic observations of hanging drop slides prepared from diluted samples.

Table Cream

Single or table cream is subject to a defect known as "cream-plug," the outcome of a slight and often not noticeable churning effect during handling, pasteurizing, cooling, and bottling. Some of the fat in such cream rises readily and forms a tough, compact layer or plug at the top of the bottle, which varies from an almost negligible thickness to a depth of an inch or more in bad cases. Such cream is often judged sour or spoiled by the housewife, and complaints are always received by the milk dealer. Besides being unsightly, bottled cream with evidences of "cream-plug" has a thin underlayer. Even if it is remixed the product will "oil-off" in coffee and will not stay homogeneous.

To overcome this defect and produce a cream of unusual smoothness and rich appearance, many milk dealers homogenize their table cream, if the process is not unlawful. This is done at low pressure to prevent excessive fat clumping and undesirable thickness. High pressures are prone to cause the cream to "feather" in coffee. The



Two-stage Manton-Gaulin valve head, showing the wheel screws for controlling opening of homogenizing valves

pressures usually used is between 500 and 1,000 lb. Such cream is popular with customers because of its richer taste, velvety smoothness of texture, and ability to "go farther."

Whipping cream cannot be so homogenized, because

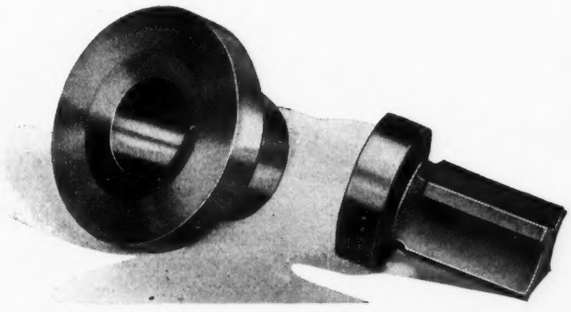
the ability to whip and take on rigidity is destroyed by the process, just as is the ability to churn.

Chocolate Milk

Chocolate milk is a product that is being prepared by milk dealers in ever-increasing amounts. Usually it consists of half skim milk and half whole milk, plus the proper amount of sweet chocolate sirup. Many dealers are using whole milk as a base—in fact, a few states require whole milk to be used if the product is to be labeled "chocolate milk." As this product commonly contains considerable fat, it separates a cream layer that is dark and unsightly in appearance, owing to the fat carrying chocolate particles up into the cream layer as it rises. If chocolate milk is homogenized the fat can be prevented from rising, but it has been found that high pressures of homogenization cause increasingly heavy deposits of chocolate sediment in the bottom of the bottle. For this reason the pressure used is kept low, only sufficient being employed to prevent creaming—about 500 lb. Where this method of preparation is used, a bottle having only a thin layer of sediment can be placed on the market, whereas without homogenization a dark cream layer, as well as a sediment layer, is obtained, unless high pasteurizing temperatures (155 deg. F. to 170 deg. F.) are used to destroy creaming ability, in which case the sediment layer is even deeper than where homogenization is used.

Commercial Sour Cream

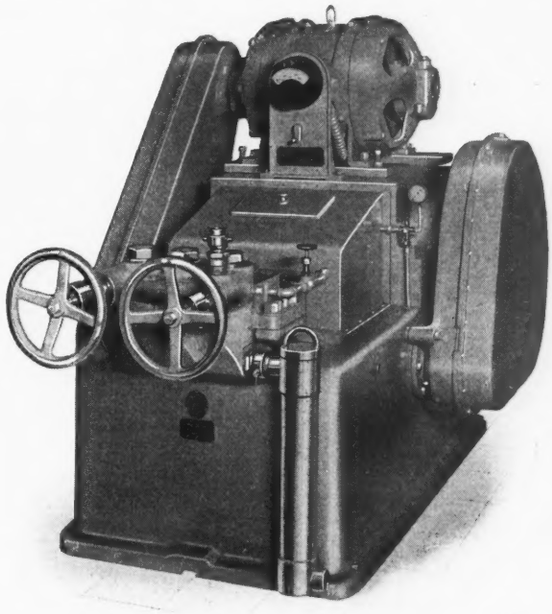
Many of the milk dealers supplying the larger cities, especially those where the proportion of inhabitants of eastern European extraction is large, have developed an outlet for surplus cream and cream and milk returned from the routes in a sour cream product commonly known as "Jewish sour cream." This product is usually of about the same richness as single or table cream and is prepared by ripening the cream with a starter to an acidity of about 0.6 per cent. It has a clean, acid flavor. Above all else it must have a smooth texture and a viscosity or rigidity amounting to a complete loss of fluidity. In producing proper "body" and texture, no method of processing or handling gives results that compare with homogenization. Homogenization is carried out after pasteurization of the cream and prior to cooling and



National Equipment Company homogenizing valve and seat, commonly of Stellite metal

inoculation with starter. The pressure used is comparatively high, as clumping of the fat globules is responsible for the very great increase in viscosity. By preventing slight churning effects in the cream, the process overcomes the slight granular texture common to sour cream manufactured without homogenization. Naturally, as viscosity is wanted, two-stage homogenization is of no advantage, and is not used.

Evaporated milk is familiar to almost everyone as a cream-colored product sold in tins, which, if unopened, will keep indefinitely. Many have noticed the fact that cream does not rise to the top of the can, as might be expected, but stays homogeneously dispersed throughout



Three-cylinder, two-stage National Equipment valve homogenizer—newer type using an ammeter on the motor instead of a pressure gage

the body of the milk. The lack of a cream layer in evaporated milk is attributable to the use of an homogenizer in the manufacturing process that creates a permanent emulsion of the fat. Before the use of homogenizers, the defect of "cream separation" and "churning" was quite common in evaporated milk, presenting one of the biggest problems of manufacture.

Evaporated Milk

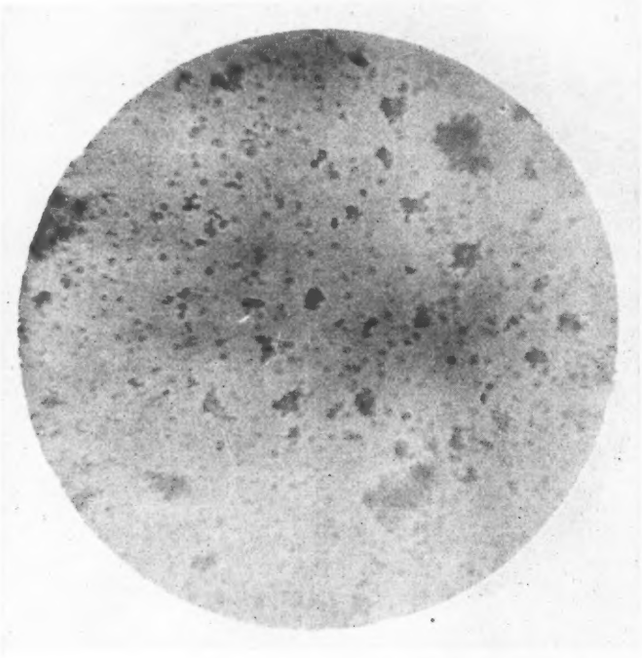
Evaporated milk is homogenized directly after condensing, while the milk is warm, usually at pressures between 2,000 and 3,000 lb. Higher pressures, although creating more stable emulsions, also de-stabilize the proteins in the presence of fat. This effect is undesirable, because evaporated milk owes its keeping quality to sterilization by heating, and if the proteins of the milk are not fairly stable, they coagulate during the sterilization process and give a rough, granular texture to the product. Such milk is often a total loss. Homogenization, therefore, must overcome creaming tendencies entirely, but must not be so rigorous as materially to affect protein stability.

After homogenizers became indispensable equipment in the evaporated milk industry, adjustment of the amount of fat and solids was possible, thus permitting the use of sweet butter in place of cream. Prior to this butter was never used, owing to the impossibility of properly emulsifying it into the product: often large amounts of cream had to be purchased and kept under refrigeration until used. Cream, of course, has a short keeping period, whereas butter keeps almost indefinitely

and requires much less storage space for an equal amount of fat. When butter is used in evaporated milk, it is usually made into a cream by homogenizing with a portion of the batch. This cream is then added to the main batch before it is homogenized, giving the added butter two trips through the machine.

Sweetened Condensed Milk

Infrequently the homogenizer is used in the manufacture of sweetened condensed milk. This product, because of the high total solids content, coupled with the tendency to thicken on aging, has an extremely high viscosity, so that fat globules of normal size remain more or less permanently dispersed. Occasionally, however, difficulty is experienced in keeping the fat from rising, and homogenization is resorted to. In such instances the process is carried out on the fluid milk prior to condensation.



Low power illustration of the clumped condition of the small globules created by the homogenizer when the fat content is sufficiently great

Powdered Milk

Although the homogenizer is not a familiar piece of equipment in powdered milk plants, investigation has shown that when whole milk powder is made from homogenized milk, the keeping quality of the powder, as far as oxidation of the fat is concerned, is distinctly superior. This holds true even for powders made by the spray process, where an homogenizing effect is always obtained automatically from the spray nozzles. The reason for this improvement in keeping quality is not known.

Cheese

Homogenization of milk for cheese making is not unknown, but it is very uncommon. Experimental evidence shows that the process does have advantages. When milk is homogenized prior to coagulation, the loss of fat in the whey, regardless of the type of cheese being made, is greatly reduced. This can be explained largely on the basis of the increased stability of the fat emulsion, which prevents a partial churning during the stirring processes and causes more fat to be occluded in the curd at the time of coagulation. It must be mentioned, however, that homogenizing the milk used for some types of cheese produces undesirable results in texture, body, or flavor of the cured cheese.

The effects of homogenization in the products mentioned thus far are principally effects on the fat emulsion. A few dairy products are homogenized in order to remove a granular condition of the "body" attributable to a flaky condition of the coagulated casein.

Superheated Condensed Milk

Superheated condensed milk is a product of "heavy body" or high viscosity. This thickened condition is obtained by subjecting the milk to high heat treatment after condensation, which causes the casein to coagulate as a smooth junket-like curd. Such a coagulation, if properly obtained, gives a smooth non-granular texture after agitation, and such texture is desired. Occasionally, a flaky condition of the curd is obtained, such that the salability of the product is jeopardized. When the condition is not too bad, homogenization is capable of smoothing the texture and creating a first-class product from one that otherwise would be quite inferior. In this instance the forcing of the product through the homogenizer valve at great velocity seems to reduce the fairly large curd aggregates to a microscopic size, giving an apparently smooth texture.

Soft Cheeses

Some types of soft cheese, such as Neufchatel, cottage, and Philadelphia cream, can be greatly improved in texture by homogenization. As with superheated condensed milk, the improvement in texture brought about is attributable to a subdivision of the curd particles of the cheese. In order to homogenize such products, they must not be too thick, otherwise the machine will be incapable of pumping them through the homogenizing valve. For this reason they are sometimes homogenized before final pressing, depending on the conditions and the cheese being made. In cream cheese, where the fluid raw product contains considerable fat, homogenization of the fluid prior to coagulation may also be practiced. This prevents fat from rising during ripening and eliminates fat loss in the whey.

It can be said without exaggeration that the homogenizer is fast becoming an indispensable piece of equipment in practically all dairy plants (with the exception of creameries) where is is desired to manufacture the highest quality products possible. A great deal of research work is needed to give the industry a better understanding of the action of the homogenizer on the various products processed with it. The effects are known fairly accurately, but the reasons therefore are not well understood. Some of the results produced by homogenization are difficult to predict with certainty, as many factors affecting the process have never been thoroughly investigated.

New Dry Ice Plant

The Liquid Carbonic Corporation has entered into a contract with the Dry Ice Corporation of America whereby it is to furnish the raw material for the manufacture of carbon dioxide ice at Liquid Carbonic's Chicago plant.

Getting Low Temperatures Economically

How the Two-Stage Compressor, Using Water Followed by Ammonia-Cooled Intercooling, and Then Ammonia-Cooled Sub-Cooling of the Liquid Ammonia, Makes Possible at Reasonable Cost the Low Temperatures Required by Quick Freezing

By ROBERT S. WHEATON
Milwaukee, Wis.

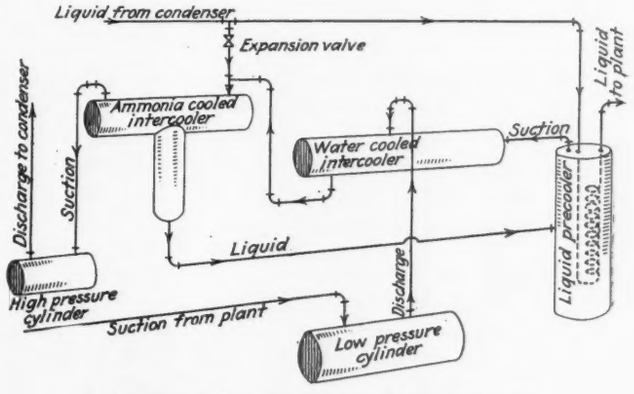
MORE MEMBERS of the food products industry are continually finding advantages in using extremely low temperatures for the quick freezing of food products. Members of the fishing industry have recently begun the practice of freezing fillets very quickly by means of special machinery which uses brine at a temperature of 40 to 45 deg. below zero. This is typical of the trend which seems to be started in the industry, and no doubt other applications of this method may be anticipated. It is fortunate that the refrigerating engineers started a number of years ago to develop refrigerating machines which would be suitable for the application of the extremely low temperatures which are now desired.

Ordinary single compressors present several difficulties when extremely low temperatures are desired, and as a result a two-stage method of compressing ammonia gas was evolved which would eliminate the operating troubles occasioned by single-stage compression and would also result in a decided saving in the power bill as compared to the power cost when single-stage compression is used. Power savings have run as high as 15 to 18 per cent, and under these circumstances, if the manufacturer has a refrigerating capacity of 50 tons or more, he is warranted in giving careful consideration to the use of two-stage equipment, as he usually finds that the savings over a term of years will be sufficient to pay for the additional cost of two-stage machines and also give a very good return on money invested, to say nothing of the convenience enjoyed by the reduction of operating difficulties.

A discussion on the whys and wherefores of two-stage compressors can be very involved, but it is believed that a diagram such as is here shown will readily indicate to the inexperienced person the various parts of the two-stage compressor and the relation that they have to each other. The system appears to be somewhat complicated, but it is just as easily operated as the duplex compressor; the only thing different, in addition to normal operation, is the regulation of the expansion valve shown in the sketch. Experience soon teaches the operator how far to open the valve, and frequent adjustments are not required.

The normal operation of two-stage units consists of the suction gas coming from the plant, in and out of the low-pressure cylinder, from which it goes into the intercooler of the shell and coil type cooled with water. Here some of the superheat is taken out of the ammonia gas, but not all of it, as there is not enough cold water. From this water-cooled intercooler the gas goes to the ammonia-cooled intercooler, and at this point the gas comes into direct contact with liquid ammonia fed into this intercooler. All of the superheat is taken out of the gas at this point, and, as would be expected, the volume of the gas is reduced. The gas then goes to the high-pressure cylinder and from there it is discharged to the ammonia condenser.

The liquid from the condenser is again conducted to the plant in the usual manner, with one exception: it is first run through a coil which is submerged in a liquid cooler where the ammonia is chilled before going into the plant. This chilling of the ammonia, or precooling of it before it is expanded into the coils from the plant, results in an evaporation of liquid surrounding the coil in the precooler; however, this liquid is evaporated at a much higher pressure than the liquid is evaporated in the coils of the plant, and most of the heat which would be used in reducing the temperature of the ammonia after it has passed the expansion valves, in the plant, is taken out at this point at a higher pressure, and this gas, being much more dense, is handled by the intercoolers and the high-pressure cylinder, which actually results in a smaller size low-pressure cylinder being used, and also in not having the coils choked with needless ammonia gas.

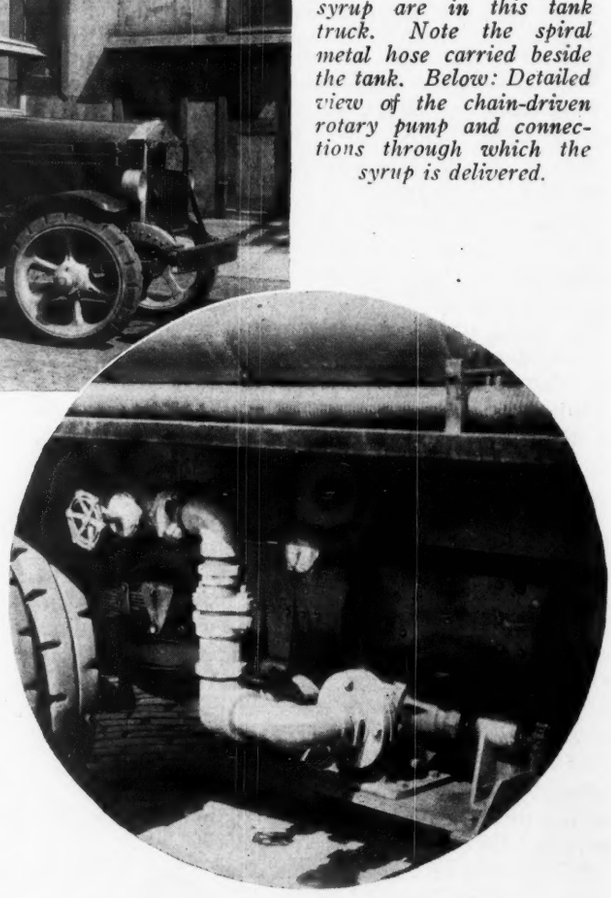


Ammonia flow for very low temperatures

All of the features indicated can readily be proved by actual installations if desired; but the manufacturer is primarily interested in what this type of equipment will do for him without determining the engineering reason why. The simple fact that two-stage compressors have resulted in a most decided saving in not only the power required to operate them, but also in power savings in the rest of the plant, occasioned by the power factor given with the synchronous motor, which is usually employed in operating a two-stage compressor, surely warrants the most careful attention of the progressive food manufacturer.

The Motor Truck *Serves as in Present-Day M*

Fifteen hundred gallons of syrup are in this tank truck. Note the spiral metal hose carried beside the tank. Below: Detailed view of the chain-driven rotary pump and connections through which the syrup is delivered.



THE dual function of the carrying container is a matter of importance when delivering syrups, for, although they are liquids that can be pumped any necessary distance and, although the length of the pipe line and power of the pumps are the only limiting factors, it is, of course, out of the question to pipe syrup around a city the size of New York. Therefore, the tank truck is the intermediary between the pipe lines of our refinery and the pipe lines of our customers.

Our tank trucks are equipped with special enamel-lined tanks, of 1,500 gal. capacity, which carry a load of roughly 17,000 lb. when full. To fill them a 4-in. rubber hose is inserted in a manhole at the top of the tank and the syrup flows in by gravity while the shipping clerk, stationed above, watches the operation and shuts off the flow when the tank is nearly full. From 15 to 20 minutes is required for filling. The quantity of syrup delivered is measured by weighing the loaded truck and deducting the weight of the truck after emptying the tank. The quantity of sugar solids is determined by the Brix hydrometer reading of the syrup.

On the side of each truck is carried a 4-in. flexible spiral metal hose with a plug screwed into each end to protect the threads as well as keep any dust from getting into the interior while en route, the hose being used for delivering the syrup from the truck to the customer's storage. The threads are standard pipe threads so that the hose may be easily screwed onto an ordinary 4-in. pipe connection at the end of the trip. Less than two minutes is normally required for the driver to make the connection between the truck and the customer's pipe lines. He then opens a cut-off valve in the customer's plant and begins delivering the syrup by pumping from the truck to storage or distributing tanks.

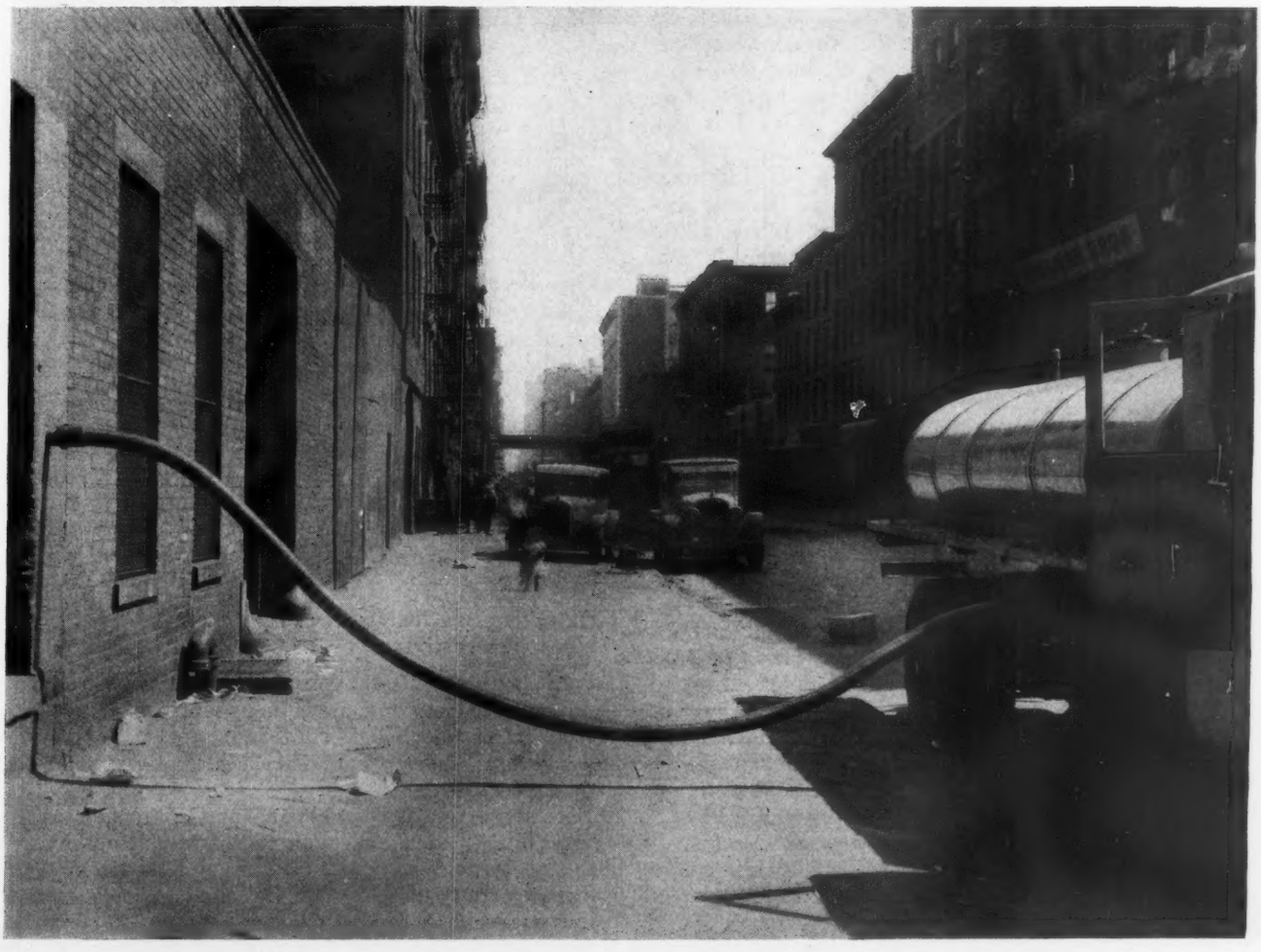
Each truck is equipped with an Excelsior 4-in. chain driven rotary pump that derives its power from the engine. With a pumping capacity of approximately 100 gal. per minute, the tank can be emptied of its 1,500 gal. in 15 minutes for simple syrup, or slightly longer for the heavier invert sugar syrup, and the syrup discharged into the buyer's storage tanks anywhere on his premises. No labor is required for unloading) at 25 minutes after the driver pulls up at the receiving point he is ready to return to the refinery. When the load is discharged there is always a certain amount of syrup left in the hose and in the customer's pipe line as far as his cut-off valve. Salvage of the residual syrup is possible by opening and closing certain valves on the truck that reverse the flow and cause the syrup to be pumped back into the tank. In this manner the hose is sucked clear of syrup before it is disconnected at the pump.

...as an Essential Unit ...Materials Handling

By D. V. WADSWORTH
Vice-President
Refined Syrups, Inc.,
New York City

With no other power than the truck engine the entire contents of the truck are elevated to the storage tanks anywhere in the building, from which the syrup is withdrawn by gravity or pumped out in the case of underground storage. We have some customers who store syrup on their tenth floor, an elevation of about 100 ft. When tank cars are used for rail delivery, owing to the absence of motive power on the individual cars, the pump is the property of the buyer and is located permanently in a pit on his premises and usually is motor-driven. In the case of tank-truck delivery the truck serves not only to bridge the gap between the pipe lines of the refinery and those of the buyer but also relieves the customer of absolutely all labor of unloading and affords an example *par excellence* of motor transportation as a unit of materials handling. The savings in labor and material, and the elimination of congestion at the receiving dock of the syrup user are possibilities that have been brought about only through the agency of the motor truck.

Curbside service—Pumping the syrup to the customer's storage tank on an upper floor. The motor truck does all the work in 15 min. A cut-off valve is just inside the door on the left.



PORTABLE RECORDING METER

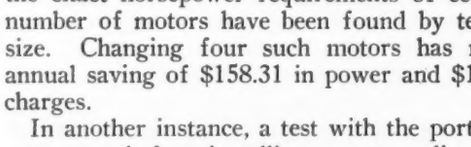
Facilitates Correct Motorization

By E. J. WEHRLE
General Electric Company

THE Quaker Oats Company's plant at Cedar Rapids, Iowa, is equipped with 834 motors having a total horsepower rating of about 13,800. Individual ratings of the motors vary from fractional sizes to 300 hp. Power cost is a heavy item of expense and every effort is naturally made to obtain efficient operation.

One of the most useful devices in the plant from this standpoint is a portable recording wattmeter which, with other recording instruments, is used to check motor sizes and to study faulty operation. The plant is partly new, and as it was not possible to determine in advance the exact horsepower requirements of certain drives, a number of motors have been found by test to be oversize. Changing four such motors has resulted in an annual saving of $158.31 in power and $125.42 in fixed charges.

In another instance, a test with the portable recording wattmeter before installing a rotary digester showed a serious fault that would have been costly to the plant had it not been discovered in time. In still another, a car dumper test indicated changes that speeded up unloading. The portable recording wattmeter is a type CP-4 and, in addition to this, the plant has three stationary recording wattmeters and a recording power factor meter. The stationary wattmeters are used on four 220,- 440- and 2,200-volt transformer banks and on the plant lighting load. The power factor meter is connected to give a continuous record of power factor for the entire plant load.



The portable instrument is used intermittently, as the need for checking arises. Potential transformers permit the extension of the normal 110- to 550-volt range to 2,200 volts. Chart speeds of 1, 3, 6 and 12 inches per minute or per hour are available. Three inches per minute is the usual speed for the portable instrument. The stationary instruments are usually set at three inches per hour.

So far the most important use of the portable instrument has been in determining the suitability of motors to their loads. This is important for the following reasons: Motor efficiency is less at low loads than within the normal range of possibly 80 per cent to 100 per cent rating, with resulting reduction in kilowatt input to motors of correct size; also, power factor is poorer at low load and the rate for purchased power is affected to some extent by the overall power factor of the total load. Of only slightly less importance is the lower fixed charge on motors representing the least investment.

As instances of the good work done, four motor changes made or to be made as the result of checking with the portable instrument will be cited. Complete data are given in the accompanying table.

In August, 1928, a 125-hp. motor in the oatmeal mill was tested and found to have an almost steady input of 30.4 kw., corresponding to 32.4 hp. It was apparent that a 50-hp. motor would carry the load at better efficiency, at higher power factor, and with less investment. A study of the characteristic curves of the old and of the proposed new motor soon to be installed showed:

	Old	New	Difference
Rating ..... per cent	25.9	64	.....
Efficiency ..... per cent	80	89	.....
Kw. input	30.4	28.3	2.1
Power factor ..... per cent	50	79	.....
Reactive kva.	52.6	21.9	30.7
Investment	$1,484.00	$421.20	$1,062.80

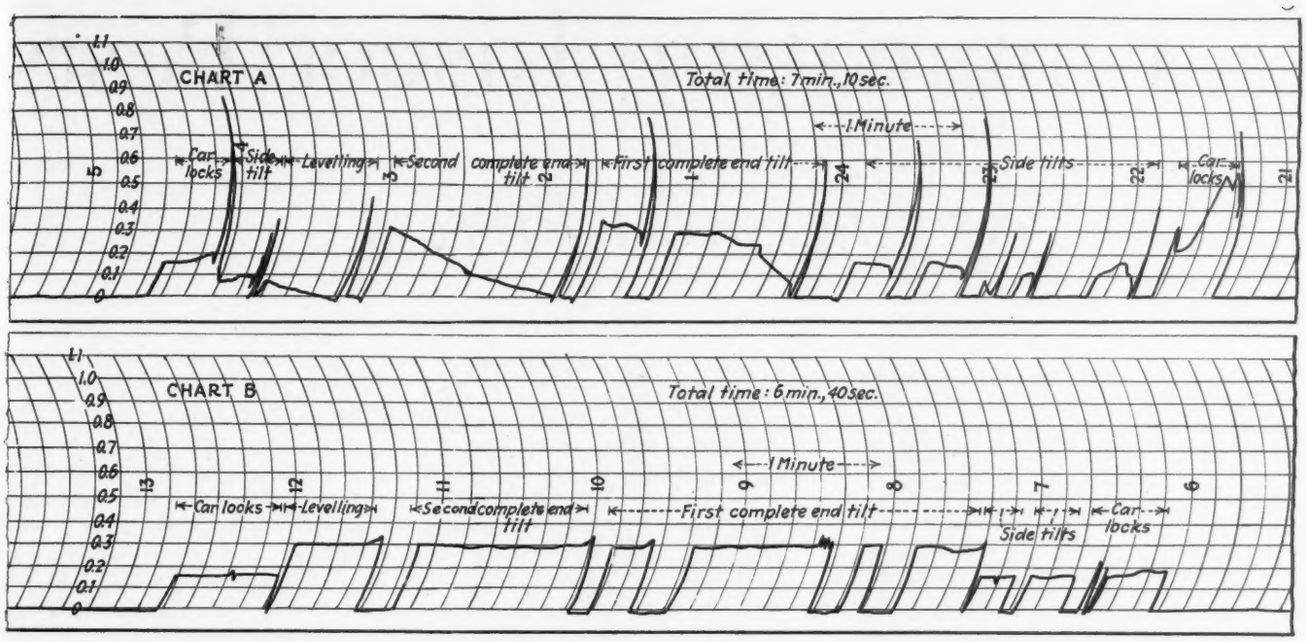
The effect of removing 30.7 reactive kva. on the general power factor of the system has not been studied, but it is only by insuring that each motor is operating at the best power factor possible that the power factor of the entire load is maintained at its best.

Three other cases are shown on the table. The total effect of the four changes will be:

Reduction of kw. input	2.39	
Reduction of reactive kva.	40.9	
Saving in power cost		$158.31
Reduction of investment	$1,271.20	
Saving in fixed charges		$125.42
Total saving—excluding effect of higher power factor		$283.73

It is entirely fair to consider the saving in fixed charges as a net saving, even though new motors were purchased, inasmuch as with 834 motors now in use and additions under way the replaced motors would be put to other uses.

Recently a rotary digester was purchased and tested before final installation, with the resultant discovery that the bearings were out of line and the shaft was sprung. A copy of the graph was used to prove to the manufacturer that the machine was faulty.

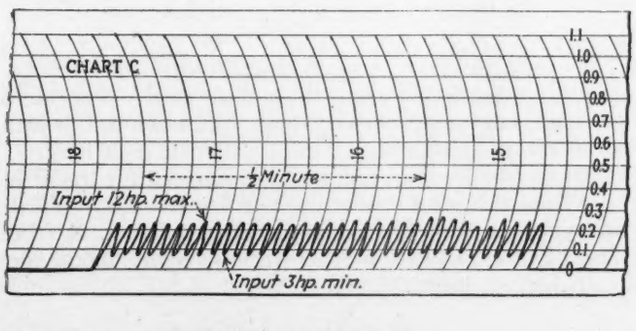


A chart made on a molasses pump of the reciprocating type gave a complete story of its operation—average and maximum power input, strokes per minute, and frequency with which the cylinder failed to fill with molasses. The latter was shown by a sharp drop of input over several strokes, giving the data required to correct the condition.

Box cars loaded with grain are run upon a power dump to speed unloading. A car is locked to the track, is tilted sideways to permit opening the door, is tilted back to allow grain in the center to run out, is tilted lengthwise twice to clear grain out of the ends, and finally is returned to the original position.

With the idea of speeding up the operation and improving operation, the portable recording wattmeter was connected to chart the input to all motors. Chart A, a reproduction of the graph, shows each operation distinctly, involving an overall time of seven minutes and ten seconds, with room for improvement in starting equipment on all motors. It was thought wise to replace the two 10-hp. motors used for car locks, and to accomplish the side tilting with 11-hp. motors of a somewhat different type. The 30-hp. motor on the end tilting operation was retained, but changes were made in the control.

The wattmeter was then connected again and another graph made for a similar car, shown in Chart B. Reference to this graph in the accompanying illustration shows that no heavy current swings occur at starting. Apparently each movement is made more positively, and the overall time is 6 minutes and 40 seconds—a saving of half a minute.



It is, of course, apparent that the power consumption was greater after the change was made, but that factor was not as important as the element of time saving. The graph in Chart C shows an ideal electrical operating condition, whereas the first indicated much room for improvement. Without the portable recording wattmeter it would have been difficult to determine the exact time sequence of operations, and it would have been practically impossible to determine motor loads at starting and over the short operating periods. These data were obviously essential for making the needed changes.

QUAKER OATS COMPANY

Data on Motors Changed as a Result of Tests With General Electric CP-4 Portable Recording Wattmeter

					Totals	
Motor—Old						
Rating in hp	125	30	25	10	190	
Kw. input	30.4	9.9	7.83	3.75	51.9	(A)
Efficiency, per cent	80	88.5	86.5	83	.....	
Load in hp	32.4	11.65	9.03	4.15	.....	
Load (per cent rating)	25.9	38.9	36.1	41.5	.....	
Power factor, per cent	50	61	65	57	.....	
Reactive kva	52.6	12.8	9.2	5.4	80.0	(C)
Motor—New						
Rating in hp	50	15	10	5	80	
Load in hp	32.4	11.65	9.03	4.15	.....	
Load (per cent rating)	64	77.7	90.3	83	.....	
Efficiency, per cent	89	89.5	87	85	.....	
Kw. input	28.31	9.76	7.78	3.66	49.51	(B)
Power factor	79	78	79	73	.....	
Reactive kva	21.9	7.8	6.0	3.4	39.1	(D)
Power Reduction						
Kw. (A)-(B)					2.39	
Annual saving @ $.0092/kw.-hr.—7,200 hr.					$158.31	
Reactive kva. (C)-(D)					40.9	
Investment						
Old	$1,484.00	$254.70	$225.00	$134.10	$2,097.80	
New	421.20	175.00	134.10	96.30	826.60	
Reduction	$1,062.80	$79.70	$90.90	$37.80	$1,271.20	
Fixed Charges						
Old—depreciation	$98.93	$16.98	$15.00	$8.94	.....	
Avg. interest	47.49	8.15	7.20	4.29	.....	
Total	$146.42	$25.13	$22.20	$13.23	$206.98	
New—depreciation	$28.08	$11.67	$8.94	$6.42	.....	
Avg. interest	13.48	5.60	4.29	3.08	.....	
Total	$41.56	$17.27	$13.23	$9.50	81.56	
Saving in fixed chg.	$104.86	$7.86	$8.97	$3.75	$125.42	
Total Saving						
Power					$158.31	
Fixed charges					125.42	
Total per year					$283.73	

Efficiency and power factor figures from characteristic curves of individua motors.
Load in hp. = kw. input × efficiency ÷ 0.746
Kw. input = hp. rating × per cent load × 0.746 ÷ efficiency.
Reactive kva. = active kw. × tang. of angle whose cos. is the power factor
Depreciation based on 15-year life.
Average interest formula = $\frac{1}{4}$ × cost × 0.06/2.
Power cost shown for 300 24-hour days at $0.0092 per kw.-hr.

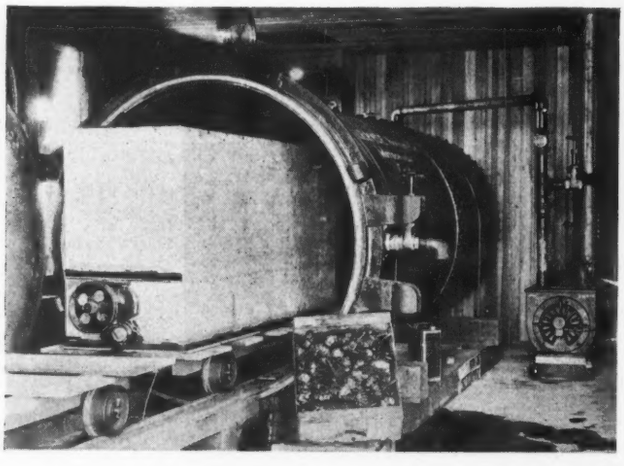
Eliminating Insect Pests

A New Industrial Process

By LAURENCE V. BURTON
Assistant Editor

RETURNED GOODS, the bane of nearly every commercial enterprise, are particularly obnoxious in the food industries, when the cause of the rejection is insect infestation, largely because of the psychological effect on the trade or on the ultimate consumer, for the damage to good will is entirely apart from the monetary losses that are sustained from this form of food deterioration or spoilage. If a woman opens a package of food and finds it wormy it is almost a foregone conclusion that henceforth she will patronize some other brand. Without some form of pest control a great many foods are subject to the trouble here under consideration, despite the greatest care in manufacture and the most scrupulous cleanliness in the factory. Baked goods which normally become inedible within a period of time shorter than would be required for insects to develop, and foods that are hermetically sealed in tins or glass containers and sterilized, are practically the only ones that are free from the danger of insect infestation.

One solution of the problem of insect pests is fumigation of the food and its protection from secondary infestation, but although the remedy is simple and the means of carrying it out are commercially available, most food manufacturers have been slow to accept it. Just why the benefits of advanced food technology are not more generally embraced need not concern us here. The remedy has been developed and it ought to be employed wherever necessary.



An adaptation of vacuum fumigating equipment to impregnating roots and bulbs with insecticidal solutions, not suited for foods because there is no way to remove the fumigant

The following foods—the more common ones susceptible to destructive infestation—together with a brief description of their commoner pests, are quoted from "The Prevention of Insect Damage to Raw and Manufactured Products," published by the Calcyanide Company, 1927:

Biscuits and Crackers

Commonly infested by saw-toothed grain beetle.

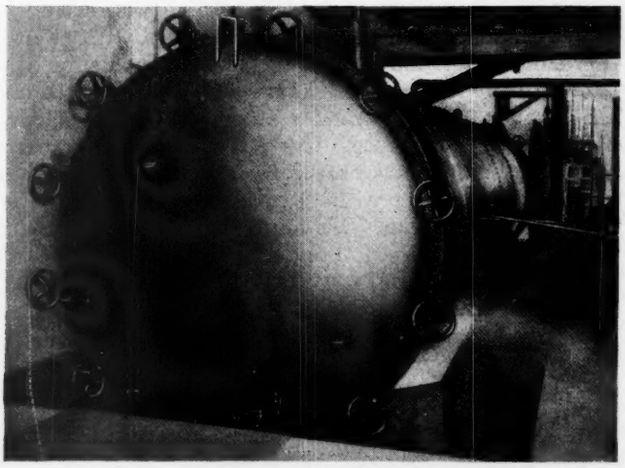
Description: See under "Candies."

Common sources of infestation: Dried fruits; nut meats; used sacks and storage containers; flour and meal; sugar (occasionally); biscuits, crackers and wafers; carton goods; natural migrations of adults by crawling from place to place.

Candies

Commonly infested by indian meal moth; saw-toothed grain beetle.

Description: Indian meal moth—moth wing expansion about three-fourths inch, with inner third of front wings



Killing the rice weevil in a Texas rice mill with carbon bisulphide. A J. P. Devine Company unit.

dirty white in color; balance reddish-brown. Each female lays about 350 eggs on or near food. The larva (worm) is the stage causing injury and, when full-grown, is whitish to flesh colored, about one-half inch long.

Saw-toothed grain beetle: Adult is a tiny reddish-brown beetle about one-tenth inch long. Each female can lay more than 200 eggs, in cracks, crevices, or food. The larva is whitish to yellowish in color, about one-tenth inch in length.

From Foods By Fumigation

Common sources of infestation: Dried fruits; nut meats; used sacks and storage containers; spices; nut and fruit candies; carton goods; sugar (occasionally); natural flights of adults.

Cereals (Milled) and Flour

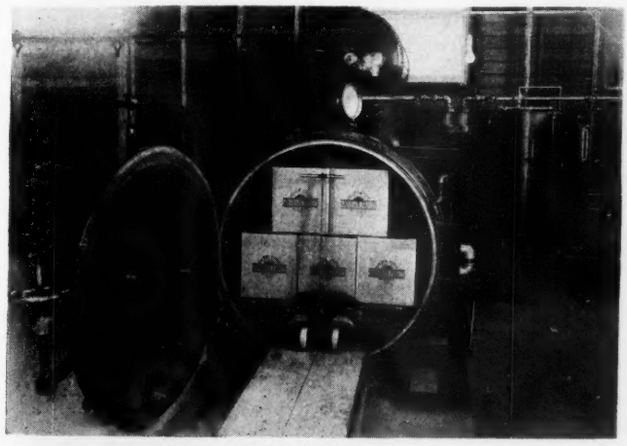
Commonly infested by: Indian meal moth, Mediterranean flour moth, dark meal worm, Cadelle beetle, rust red flour beetle, meal snout moth, yellow-meal worm, saw-toothed grain beetle, confused flour beetle, broad-horned flour beetle.

Description: Owing to limited space, a description of the above-mentioned insects is not here attempted. Some of them will be found described under other classifications.

Common sources of infestation: Accumulations of flour and other loose milled cereals in cracks and corners; unsound and infested grain; returned or exchanged sacks; returned damaged goods; flour and cereals stored in torn sacks and broken packages; flour and cereals of high moisture content; natural flights and migrations of adults.

Cereals (Whole Grain)

Commonly infested by: Granary weevil, Cadelle beetle,



Packaged foods as well as bulk foods may be quickly and successfully fumigated

pink corn worm, rice weevil, Angoumois grain moth, saw-toothed grain beetle.

Common sources of infestation: Grain stored over long periods of time; grain of high moisture content; infestation from field (except in case of granary weevil); natural flights and migrations of adults.

Cheese

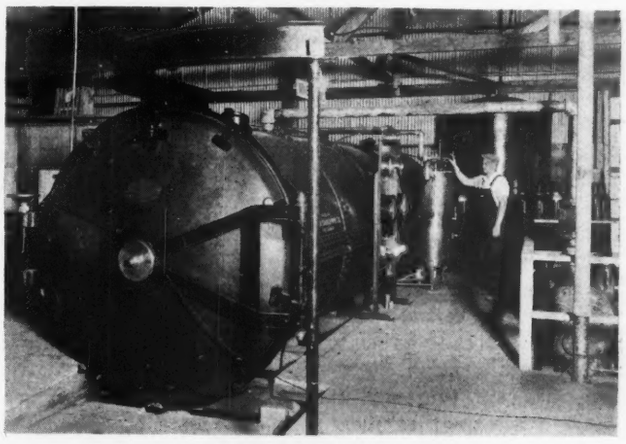
Commonly infested by Cheese skipper; cheese mite.

Description: Cheese skipper: Small, shiny, black fly with reddish-brown eyes resembling winged ant. Each female lays as many as 250 eggs in cracks or on food. The active, damaging stage is the larva—a slender white worm which can be readily identified because of its habit of bending in an arc and straightening out suddenly. This habit enables the larva to hop or skip considerable distances; hence the name cheese skipper. Cheese mite: Pale, soft-bodied organism, barely visible as small white speck.

Common sources of infestation: Cheeses; cured meats.

Dried Fruits

Commonly infested by Indian meal moth; dried fruit beetle; saw-toothed grain beetle.



The carbon bisulphide is evaporated to a gas in the vertical cylinder by the operator, mixed with carbon dioxide and drawn into the fumigator. A Vacufume Company unit.

Description: Indian meal moth—see under "Candies." Saw-toothed grain beetle—see under "Candies." Dried-fruit beetle—Flattened black beetle with two yellowish brown spots on back. The active, injurious stage is the larva, which is about one-fourth inch long, with two stubby spines at the anal end.

Common sources of infestation: Dried fruits held over from one season to the next; returned damaged dried fruits; infested box cars and containers; accumulations of fruit in packing houses.

Macaroni and Spaghetti

Commonly infested by: Granary weevil; rice weevil; saw-toothed grain beetle.

Description: See under "Cereals" (whole grain).

Common sources of infestation: Macaroni; spaghetti; raw materials (whole grain); semolina; returned damaged goods; stored infested products; natural migration and flights of adults.

Meats (Cured)

Commonly infested by: Red-legged ham beetle; cheese skipper.

Description: Red-legged ham beetle—a shiny, green beetle nearly one-fourth inch long. Female lays more than 1,000 eggs in dry crevices and on or near food. The larva is a dirty white, wrinkled, hairy worm about three eighths inch long. Cheese skipper—see "Cheese."

Common sources of infestation: Poorly wrapped meats; infested stored meats; meats stored in warm, semi-exposed rooms; natural flights of adults.

Nuts

Commonly infested by: Indian meal moth; saw-toothed grain beetle.

Description: See under "Candies."

Common sources of infestation: Nut meats stored for long periods; returned damaged goods; natural flights and migrations of adults and larvæ.

A good fumigant for foods must possess certain characteristics, the first and most important of which is its ability to destroy not only the living insect but likewise the eggs, for if only the adults were to be killed it would be but a short interval of time until the eggs would hatch out a new brood, and the only benefit gained by such a half-fumigation would be to defer the period of damage.

Second in importance is the ability of the fumigant to perform an efficient disinfection without affecting the quality of the food. These two qualifications automatically rule out many of the commonly suggested insect exterminators.

A third characteristic of nearly equal importance is that the fumigant must be removable from the food after it has performed its service and that it shall not leave a permanent residuum of obnoxious or dangerous substances. Some fumigants leave a deposit upon the food under treatment, and are thus automatically ruled out.

A fourth qualification for a good fumigant is penetrability, and, to meet this requirement, only gaseous substances may be employed or substances that are gaseous at temperatures to which a food may be subjected without injury or alteration.

At present two well-known substances are commercially available that meet the requirements of a good fumigant—namely, carbon bisulphide and hydrocyanic acid gas. The latter is obtainable in three forms: the solid sodium or potassium cyanide from which the hydrocyanic acid is liberated by sulphuric acid; the dry powdered calcium cyanide from which the hydrocyanic acid is liberated by atmospheric moisture; and the liquid hydrocyanic acid shipped in pressure cylinders. A third substance, ethylene oxide, is one that appears to hold considerable promise and is now being studied by the U. S. Department of Agriculture. Other substances may occasionally be used for fumigating foods, and research will probably develop still other food fumigants.

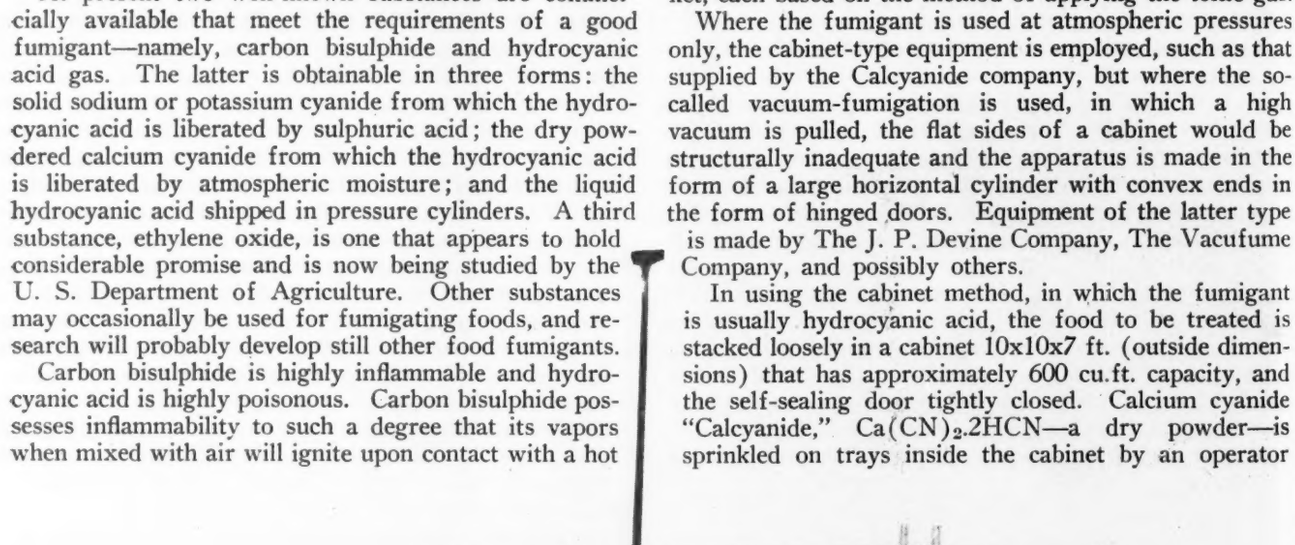
Carbon bisulphide is highly inflammable and hydrocyanic acid is highly poisonous. Carbon bisulphide possesses inflammability to such a degree that its vapors when mixed with air will ignite upon contact with a hot steam pipe. Liquid hydrocyanic acid gas in pressure cylinders—in distinction to its other available forms—is also a dangerous substance for the reasons that the slightest leak in the valves or piping may be the cause of the death of the operator or others. Possessing such hazardous characteristics, these two fumigants must be handled in special equipment and under controlled conditions in which all danger to life and property is reduced to a minimum. When so handled with proper care and intelligence in any of the three different types of properly designed equipment the hazard involved is virtually nil.

In discussing food fumigation it should be pointed out that the subject is the fumigation of a commodity and is clearly differentiated from the fumigation of buildings, mills, and factories. It is recognized that today a great deal of fumigation is carried out in fumigating rooms, such as are found in nearly every seedsman's warehouse, but the discussion in this paper is confined to the latest and more refined methods where the disinfecting treatment may be regarded as an industrial process in which there is accurate control of the conditions of fumigation and where the operation may be performed with the same degree of safety to the operators as would be expected in the operation of a steam boiler.

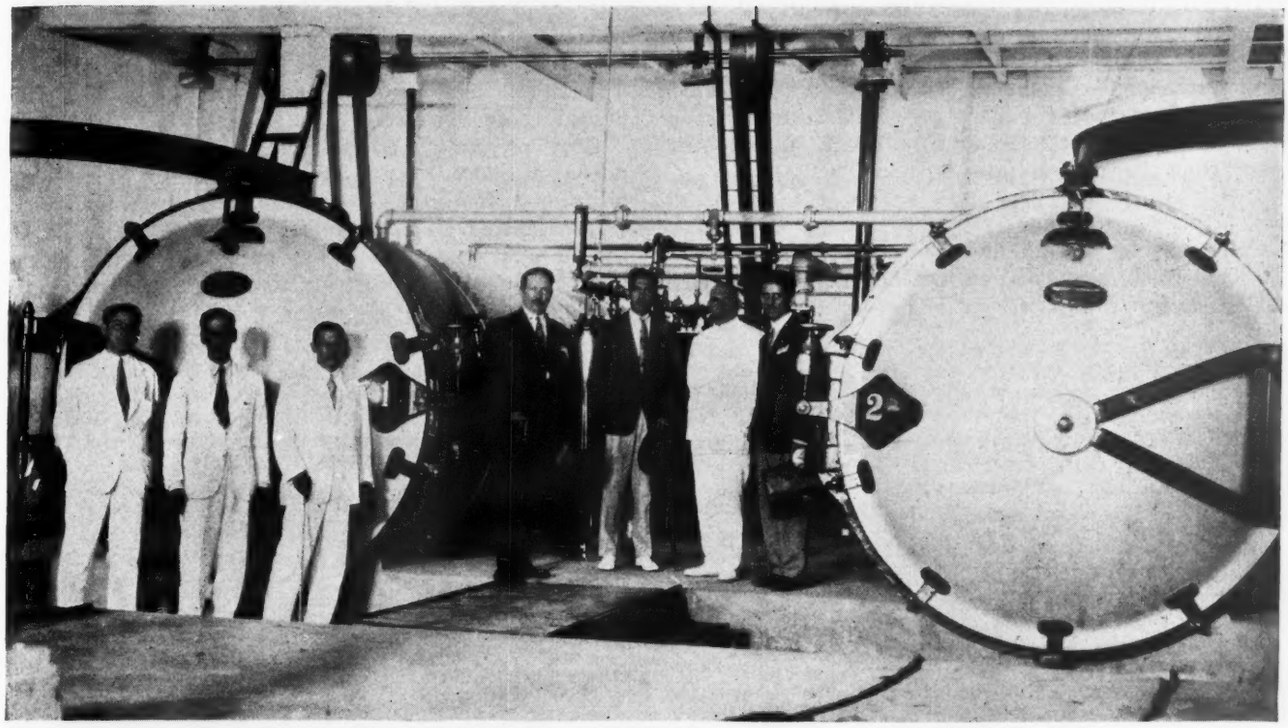
Apparatus must be gas-tight to be commercially practicable, except where open-tank fumigation is practiced. Of the closed-type equipment two forms are on the market, each based on the method of applying the toxic gas.

Where the fumigant is used at atmospheric pressures only, the cabinet-type equipment is employed, such as that supplied by the Calcyanide company, but where the so-called vacuum-fumigation is used, in which a high vacuum is pulled, the flat sides of a cabinet would be structurally inadequate and the apparatus is made in the form of a large horizontal cylinder with convex ends in the form of hinged doors. Equipment of the latter type is made by The J. P. Devine Company, The Vacufume Company, and possibly others.

In using the cabinet method, in which the fumigant is usually hydrocyanic acid, the food to be treated is stacked loosely in a cabinet 10x10x7 ft. (outside dimensions) that has approximately 600 cu.ft. capacity, and the self-sealing door tightly closed. Calcium cyanide "Calcyanide," $Ca(CN)_2.2HCN$—a dry powder—is sprinkled on trays inside the cabinet by an operator



The exhaust of the vacuum pump must be discharged in a safe place. Fumigating almonds in California.



Two Vacufume 5x15-foot fumigators at Reshadich, Turkey, 60 miles from Smyrna, which treat 5,000,000 pounds of figs annually. The gentleman in the center is H. E. Kiazim Pacha, Governor General of Smyrna.

reaching through a small hand door, and the opening is then closed with a self-sealing door. By special air-conditioning equipment of small size the humidity and temperature of the air within the cabinet are brought to optimum conditions for fumigating, a circulating fan is put in motion, and hydrocyanic acid gas is now liberated from the calcium cyanide through its interaction with the atmospheric moisture within the closed cabinet. When the proper period of fumigation has elapsed, the vent pipe to outdoors is opened and the lethal gas is "washed" out by fresh air.

The vacuum method of fumigation requires apparatus somewhat more complicated. Vacuum is used in order to increase the rate of penetration of the lethal gas by exhausting all the air surrounding the food, and within its tissues, by pulling a 27- or 28-in. vacuum in the chamber, and subsequently relieving the vacuum by allowing the fumigant to flow into the chamber. Contact of the destructive agent with all parts of the food is thus greatly facilitated, and likewise the removal of the toxic gas by "washing" with fresh air is rendered more easy.

Either hydrocyanic acid or carbon bisulphide is used with the vacuum method, but the latter is the more common with foodstuffs. A greater degree of accuracy is attained when using vacuum in connection with carbon bisulphide, for by this means the presence of oxygen can be controlled through the simple expedient of pumping out the air, and thus the fire hazard is greatly reduced. In the past, however, vacuum alone has not completely controlled the fire and explosion hazard and, to give the desired degree of safety, a mixture of carbon dioxide gas and carbon bisulphide has been developed. The use of this inert gas has had the desired effect without impairing the efficiency of the fumigant.

Fumigation by the open tank method is a very large-scale operation in which advantage is taken of the fact that the CS_2-CO_2 mixture is heavier than air and, when properly protected from drafts, the gas will remain in a tall open-top tank filled, for example, with grain. One installation of this type is a vertical, cylindrical, steel tank 37x120 ft., with a distributing pipe at the bottom through which the fumigating gas-mixture is pumped, and after the proper time has elapsed the gases are "washed" out by fresh air pumped through the grain. The CS_2-CO_2 mixture is made in the equipment that is normally supplied with the vacuum fumigator, including a 5x15-ft. vacuum tank. The cycle of events followed in the open tank installation are: (1) Evacuate the vacuum tank; (2) allow the vacuum tank to fill with CS_2-CO_2 until it reaches atmospheric pressure; (3) pump the mixture into the large open tank, which at the same time again evacuates the vacuum tank and prepares it for a repetition of the cycle.

Handling the Fumigants

Hydrocyanic acid gas is purchasable as a liquid in pressure cylinders; in crystal form, as sodium or potassium cyanide; or it may be obtained in tin cans in the form of powdered calcium cyanide.

Carbon-bisulphide is a liquid boiling at 115 deg. F. and is purchasable in tin containers or in drums. When used in connection with the vacuum fumigation process it is evaporated in a separate piece of apparatus, in which it is boiled by warm water that in turn is electrically heated, and whose temperature is accurately controlled by automatic thermostats. To be fully effective the temperature of the material and atmosphere should be above 70 deg. F. This is necessary because insect life is inactive at temperatures that are but 10 or 15 deg. below this figure.

So many different factors enter the cost of fumigation that it is unwise to predict their magnitude, even in a general way, owing to the fact that they are capable of great variation in different plants with varying facilities

of material handling and wage scales, and the wide range of products to be treated, each of which possesses its individual peculiarities. There is, however, a common figure that may be evaluated for comparison's sake, which is the unit cost of fumigant per 1,000 cu.ft. of space fumigated, and when speaking of "space" the products that are in the space are also included.

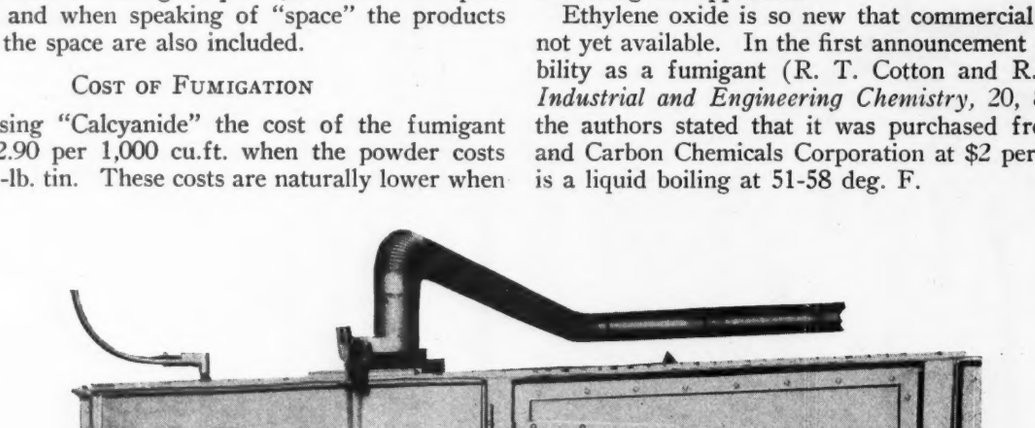
Cost of Fumigation

When using "Calcyanide" the cost of the fumigant is about $2.90 per 1,000 cu.ft. when the powder costs $1.75 per 1-lb. tin. These costs are naturally lower when 'Calcyanide" is purchased at the lower price quoted for the material in containers that are larger than 1 lb. capacity. If liquid hydrocyanic acid is used, the fumigant cost will be roughly $1 to $1.87 per 1,000 cu.ft. with the fumigant, costing $1 per pound—the variation is due to the different requirements of various products or foods.

Carbon-bisulphide is a product with a lower cost per pound, but much more of it is required to produce the same fumigating effect than is required of hydrocyanic acid. In vacuum fumigation from 30 to 40 lb. per 1,000 cu.ft. are required at a cost of about 10 cents per pound, or $3 to $4 per 1,000 cu.ft. To this, of course, must be added the cost of the carbon dioxide, which, although cheap, is not absolutely negligible.

To reduce these figures to cents per pound it will be necessary to know the weight of the food per cubic foot. Foods vary tremendously in this respect. However, it is quite evident that the cost of fumigant is a small item. In contrast to the other charges that will accrue in fumigation the fumigant itself is a relatively minor item. The largest item of cost will be that of loading and unloading the apparatus.

Ethylene oxide is so new that commercial figures are not yet available. In the first announcement of its suitability as a fumigant (R. T. Cotton and R. C. Roark, *Industrial and Engineering Chemistry,* 20, 805, 1929), the authors stated that it was purchased from Carbide and Carbon Chemicals Corporation at $2 per pound. It is a liquid boiling at 51-58 deg. F.



The airtight cabinet of the Calcyanide Company uses hydrocyanic acid, generated from calcium cyanide powder, as the fumigant. Note the padlocks that insure that no one but the operator may open the doors.

Fumigation of foods costs a trifling sum per pound, and it is an investment in insurance of quality, for, once a food has been properly treated and protected from reinfestation, it will never suffer from insect deterioration. Some few manufacturers are reported to be so thoroughly convinced of its necessity as a step in their operations that they are planning to include fumigation of all raw materials entering their plants. If no reinfestation occurs during manufacture, this step will also have virtually the effect of fumigating the finished goods.

Acknowledgments are made to Harry Stiner, of the National Biscuit Company; B. Towlen, of the Calcyanide Company; Irving Gleason, of the Union Tank & Pipe Company and the Vacufume Company, for much of the data and illustrations used in the article; and to the J. P. Devine Company for the illustration of the rice fumigating plant.

ABSTRACTS · OF · CURRENT · LITERATURE

THE CEREAL CHEMISTS' RESPONSIBILITY. *Northwestern Miller,* Vol. 157, Jan. 9, 1929, p. 118. M. J. Blish and E. E. Werner. The first obligation of the cereal chemist is to acquire the ability to ascertain, identify, and classify the properties of the materials as he finds them, as well as in the various stages of their refinement. His next step is to increase the industrial utility of such materials. His work brings him in contact with flour milling, the baking industry, and other food manufacturers. Cereal chemistry is a newcomer among the applied sciences, but it is a broad profession, and its followers endeavor to get as close to the truth as possible.

* * *

EXAMINING FATS. *Bakers Weekly,* Vol. 61, Feb. 9, 1929, p. 67. Tests for the examination of fats are described and include the following: determination of the index of refraction with the Abbé refractometer and also with the Zeiss-butyro-refractometer; detection of tallow in fat by the Wesson method; nitric acid test on oils; Settini color test for soya bean oil; Halphen method for the detection of cottonseed oil; and the detection of peanut oil by the Renard Tolman method.

* * *

STARCH. Arthur R. Ling. *Chemistry and Industry* 47, 1308, Dec. 14, 1928. The long prevalent opinion that the substances present in starch were essentially the same, differing in degree of hydration and polymerization, has given way to new evidence showing that there are more deep-seated differences between the outer and inner portions (amylopectin and amylose) of starch granules. It has even been possible to demonstrate that these occur in starch in a constant ratio (amylose: amylopectin, 2:1). Some starches have a third component, called amylohemicellulose, which is a silico-phosphoric ester of amylose. Studies now in progress on the nature of starch and other polysaccharides include a comparison of the enzyme hydrolysis products of glycogen and of starch.

* * *

TRIGLYCERIDES. R. B. Joglekar and H. E. Watson. *Journal of the Society of Chemical Industry,* 47, 365-68, Dec. 14, 1928. As part of a program of advancing the knowledge of oils and fats, synthetic triglycerides were prepared in a high state of purity, and physical properties were determined for single pure triglycerides and for binary mixtures. The synthetic triglycerides included stearin, palmitin, myristin, and laurin. Tabulated data are given for solidification points, refractive indexes, densities, viscosities, and surface tensions. Binary mixtures were made of palmitin and stearin, for the same determinations. Agitation of the molten mixtures was necessary, since these glycerides do not mix readily. Some differences between observed values and those recorded in the literature were noted. Literature values often lack statements of the degree of purity of the samples. In particular, the densities of palmitin and stearin were found actually to be considerably higher than previously reported. Procedures and instruments used in making the physical property measurements are described.

* * *

EFFECTS OF MASSIVE DOSES OF IRRADIATED ERGOSTEROL. *Journal of the American Medical Association,* Vol. 92, Feb. 23, 1929, p. 621. I. J. Klein. From 20,000 to 100,000 times the dose of irradiated ergosterol necessary to cure rickets was administered daily to albino rats. Such large doses caused anorexia and loss of appetite; the blood calcium concentration was increased 50 per cent; and the protein concentration of the serum was diminished. The results indicate that harm may result from excessive doses of irradiated ergosterol in rachitic animals.

* * *

HYDROGEN SWELLS. E. M. Mrak and P. H. Richert. *Fruit Products Journal,* Vol. 8, No. 5, pp. 13-15, Jan., 1929. Spoilage by the hydrogen swelling of cans is more severe with canned dried prunes than with other common fruits. In an experimental study of the causes of corrosion of the can, which results in hydrogen swelling, several factors which influence rate of spoilage were observed. Swelling is lessened by increasing weight of fruit above 120 grams per 8-oz. can; by increasing to 12.5 deg. Balling the concentration of sirup added at the time of canning; by increasing head space at time of sealing; and (to a slight extent) by increasing the time of exhaust. In a separate study of the effect of blanching on rate of hydrogen swelling, it was found that a long blanch increases the swelling, but not in direct proportion to the length of blanch. Use of a heavy sirup did not counteract this effect. Allowing for variations in the blanching treatment according to the condition of the prunes being treated, it is recommended that the blanch be not longer than ten minutes or shorter than three minutes in boiling water. Steam blanching, like hot water blanching, causes more swelling as the blanch is prolonged. Photographs of can ends and corroded areas from cans are shown.

* * *

AWARRA NUTS. *Bulletin of the Imperial Institute,* Vol. 26, pp. 413-16, Jan., 1929. The Awarra palm of British Guiana yields a nut which contains an edible oil similar to African palm oil. The yield is relatively smaller, and with the larger proportion of shell it would be uneconomical to ship the entire fruit. The pericarp oil is orange-red and semi-solid at 60 deg. F. The kernel oil is a hard, solid fat of cream color. It is probable that the whole kernels could be profitably shipped, e. g. to Europe, in competition with African palm oil. Whether or not the pericarp oil could be prepared and shipped profitably depends on yield, price and similar factors.

* * *

ORANGE RINDS. Marion B. Matlack. *Journal of the American Pharmaceutical Association,* Vol. 18, pp. 24-31, Jan., 1929. Rinds of California Valencia oranges were freed from inner membrane, dried, ground and analyzed for fats, sterols and glucosides. The fats contained glycerides of oleic, linolic, linolenic, stearic, and palmitic acids. Two phytosterols were identified. one apparently identical with sitosterol, and the other with Likiernik's paraphytosterol. A phytosterol glucoside was also found. There was evidence of the presence of ceryl alcohol, a small amount of resin, and a carotinoid pigment.

* * *

CASEIN. W. L. Davies. *Chemical Age,* Vol. 20, pp. 23-24, 43-44, Jan. 12 and 19, 1929. The term casein is used in the industry both for the caseinogen precipitated by rennet and for the form precipitated by acid. A common and objectionable impurity in commercial casein is butter fat, which is best removed by thorough centrifuging before precipitating the casein. Methods and plant for commercial production are described. Among the many uses, acid casein is preferred for adhesives and paints, but rennet casein is better for making plastics. Other uses include the compounding of medicinals and proprietary foods, and the making of artificial milk.

* * *

SPICE OILS. John H. Montgomery. *Fruit Products Journal,* Vol. 8, No. 5, p. 31, Jan., 1929. Essential oils from spices are better than the dried spices for flavoring pickles, condiments, meats, and the like. The advantages include greater uniformity, stronger flavor, better quality and color, and economies due to easier handling, storage and use. There is also a greater variety (including the rarer flavors) available than can be had in dried spices. Since the oils are expensive and require skill in their preparation and blending, food manufacturers generally depend on a flavor expert for their supply of spice oils and blended flavors. This gives the essential oil manufacturer a field both for production and service.

· CRITICAL · BOOK · REVIEWS ·

DEVELOPMENT OF THE FLOUR-MILLING INDUSTRY IN THE UNITED STATES, With Special Reference to the Industry in Minneapolis. By Charles Byron Kuhlmann, Ph. D., professor of economics in Hamline University, St. Paul, Minn. Comprises 349 pages. Published as Hart, Schaffner & Marx Prize Essay XLVI by Houghton Mifflin Company, Boston and New York. Price $3.50.

BELYING the collegiate indictment of political economy as "the dreary science," this scholarly dissertation on the economics of flour milling will undoubtedly prove to be highly informative and of more than ordinary interest to practically all who read these pages. Added weight is given to the author's statements by virtue of the fact that the present volume has been considered a worthy addition to the permanent literature of political economy by a committee consisting of five eminent political economists. The award by Messrs. J. Laurence Laughlin, *et al.*, was made in 1924. Despite the fact that the book was published in 1929, the author's text closes with 1927, as is indicated on page 224 and elsewhere.

Ranging from the first American flour mill—a single-unit windmill erected near Newtown (Cambridge) and in 1632 moved across the Charles River to Boston because of better prevailing winds—to the huge present-day electrically operated mills at Buffalo of more than 20,000 barrels' individual capacity daily, not overlooking the almost equally significant large units on the Pacific Coast, Dr. Kuhlmann covers his subject with a thoroughness that leaves little to be desired. Technically he traces the industry from its start with the traditional upper and nether millstones, driven by wind or water power—including the tidal mills of early New England—with hand-operated preliminary cleaning and subsequent bolting, through the development of the bucket elevator, screw conveyor, and "hopper-boy" or cooling device of Oliver Evans, to the present-day practice of milling "purified" middlings by the gradual reduction Hungarian system, with power derived from steam, electricity, or, at times, the Diesel engine.

The author's reasoning, at all times set forth fully, and amply documented, leads to the conclusion that the greatest future expansion of milling is to come in the hard-winter-wheat area of which Kansas City is the titular (if not the economic) center; that the relatively recent and truly remarkable growth of milling in Buffalo, because of its reliance in large measure upon such evanescent factors as tariff differentials and milling-in-bond, may not prove to be permanent; that Minneapolis will probably never regain its former outstanding leadership in American milling, principally because the declining production of high-quality spring wheat forces the price thereof to a premium above equally valuable grades in other regions; and that the future of the Pacific Coast mills is reasonably well assured, in part at least because of the vast potential market in near-by China.

In the concluding pages are found due mention of the adoption of the plan-sifter in the mill and of constantly increasing use of machinery in the packing room, of laboratory control, commercial flour blending, flour bleaching, and durum wheat and other forms of diversified products. Also are discussed the relations of the industry with union labor, trade associations in the milling field, and governmental control during the Great War, together with a full description of modern marketing of flour, both here and abroad.

R. G. GOULD.

· GOVERNMENT · PUBLICATIONS ·

Documents are available at prices indicated from Superintendent of Documents, Government Printing Office, Washington, D. C. Send cash or money order; stamps and personal checks not accepted. When no price is indicated pamphlet is free and should be ordered from bureau responsible for its issue.

Foreign Trade of the United States in the Calendar Year 1928, by Lawrence B. Mann. Bureau of Foreign and Domestic Commerce Trade Information Bulletin 602. Ten cents. Statistical summary showing imports and exports of food stuffs and other classes of commodities.

Wages and Hours of Labor in the Slaughtering and Meat-Packing Industry, 1927. Bureau of Labor Statistics Bulletin 472. Twenty-five cents. An elaborate statistical summary giving complete data only through the calendar year 1927.

Market for American Foodstuffs in Siam, by Don C. Bliss. Bureau of Foreign and Domestic Commerce Trade Information Bulletin 610. Ten cents. A discussion of character of markets and an outline of some of the methods required for handling of manufactured food products if this territory is to be served effectively.

Standards for Livestock and Meats, by C. E. Gibbons. U. S. Department of Agriculture Miscellaneous Publication 33. A discussion on the advantages accruing to livestock producers marketers, packers, and meat distributors, as well as the general public. The nature but not the details of the standards recommended are discussed.

Canned Fishery Products Statistics. Bureau of Fisheries Statistical Bulletin 821. Complete résumé of canned fish (by variety of fish) and of incidental products of the fisheries industries for the calendar year 1928, covering the business of packers in the United States and Alaska.

Statistical Review of the Alaska Salmon Fisheries: Part I, Bristol Bay and the Alaska Peninsula, by Willis H. Rich and Edward M. Ball. Bureau of Fisheries Document 1041. Twenty cents.

Tariff Information and Statistics. U. S. Tariff Commission Summaries of Tariff Information, 1929, on Tariff Act of 1922. Fifteen booklets of widely varying size summarize import, export, consumption, and other pertinent statistics and facts regarding commodities covered by the various dutiable schedules and the free list of the Tariff Act of 1922. In many instances the data given are very convenient summaries for use in estimating markets or trade conditions for other than tariff purposes. The several subdivisions of the complete report are available as follows:

1. Chemicals, Oils, and Paints; 419 pages; 40c.
2. Earths, Earthenware, and Glassware; 168 pages; 20c.
3. Metals and Manufactures of; 328 pages; 35c.
4. Wood and Manufacture of; 51 pages; 10c.
5. Sugar, Molasses, and Manufactures of; 43 pages; 10c.
6. Tobacco and Manufactures of; 17 pages; 5c.
7. Agricultural Products and Provisions; 488 pages; 60c.
8. Spirits, Wines, and Other Beverages; 21 pages; 5c.
9. Cotton Manufactures; 78 pages; 10c.
10. Flax, Hemp, Jute, and Manufactures of; 57 pages; 10c.
11. Wool and Manufactures of; 73 pages; 10c.
12. Silks and Silk Goods; 64 pages; 10c.
13. Papers and Books; 71 pages; 10c.
14. Sundries; 281 pages; 25c.
15. Free List; 516 pages; 45c.

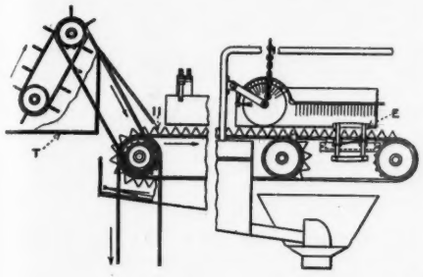
The Brazilian Foodstuffs Market. Bureau of Foreign and Domestic Commerce Trade Information Bulletin 604. Ten cents.

Depreciation Rates in the Canning Industry

Canners do not agree as to the proper charges for depreciation, according to S. H. Devault, of the Department of Agricultural Economics, University of Maryland, after a close study of the cost records (covering three years) of corn canning plants in Maryland, the combined pack of which was 25 per cent of the total of the state. Mr. Devault reports the following rates in the territory under observation: frame building, 3 to 4 per cent; concrete or brick buildings, 2 per cent; machinery and equipment (average for heavy and light machinery) 10 to 12 per cent; trucks and automobiles, 25 per cent; baskets, 30 to 50 per cent.

· SELECTED · PATENTS ·

Automatic Fish Cleaner—Andrew L. Christiansen, Wilmington, Calif., and William S. LaLonde, Los Angeles, Cal. No. 1,699,951. Jan. 22, 1929—Fish, dumped into the tank T, are elevated by conveyor and dumped onto table 11 where operators place the heads in the proper notches of a moving belt that



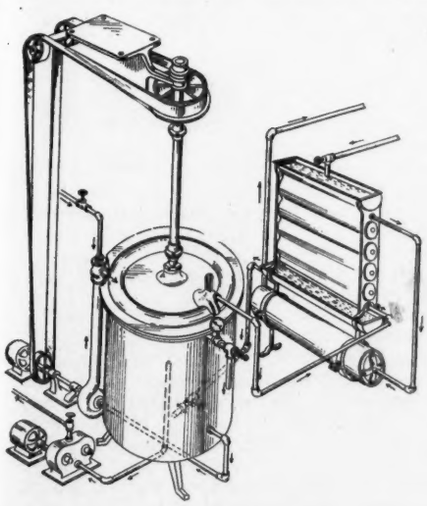
carries them under rotary knives, which only partially cut the heads off. When they pass the eviscerater E the heads are struck a severe blow which tears them loose from the body and pulls out the entrails. A spray of water completes washing and cleaning.

* * *

Food Products from Yeast — Martin Nilsson, Peekskill, N. Y., assignor to The Fleischmann Company, New York. No. 1,701,081. Feb. 5, 1929—A food product in which the flavor and keeping qualities of yeast are improved. Moisture content of compressed yeast is reduced to 55 per cent by passing air over and through the yeast at a temperature of 25 deg. C. The dry yeast is mixed with sugar or a heavy sirup to the desired consistency. The final product about 20 per cent moisture and about 60 per cent sugar. Yeast cells are not impaired by the treatment either from the standpoint of life of the cell or vitamine content. Flavor is improved.

* * *

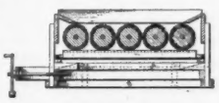
Pasteurizer—Aage Jensen, Los Angeles, Calif. No. 1,701,777. Feb. 12, 1929.—An apparatus for pasteurizing liquids by boiling in a vacuum while stirring mechanically. Regenerative cooling is employed.



Vacuum Pasteurizer

* * *

Apparatus for Treating Fruit—Albert Haworth, Winter Haven, Fla., assignor to Brogdex Company, Winter Haven, Fla. No. 1,703,144. Feb. 26, 1929—A device for polishing fruit with paraffin or wax. Revolving brushes remove paraffin from a slab and apply it to the fruit.

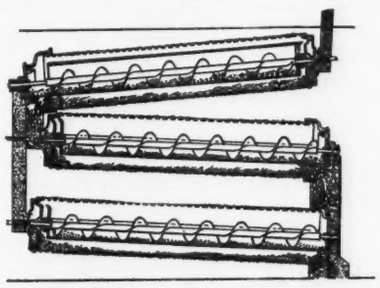


* * *

Production of Glycerin by Fermentation—Karl Ludecke and Nelly Ludecke, Berlin-Dahlem, Germany. No. 1,698,-800. Jan. 15, 1929—The inventors have found that a small quantity of salt, such as a sulphite, when added to the solution to be fermented, may be used repeatedly, if, after the fermentation has come to an end, the volatile fermentation products are distilled off and sugar is again added and fermented.

* * *

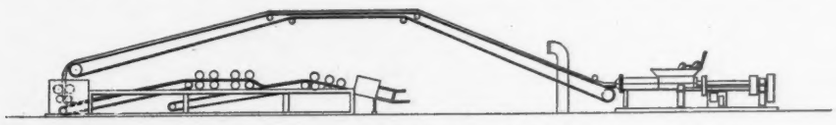
Grain Separator and Recleaning Device—Haakon Mjolsness, of Minneapolis, Minn. No. 1,705,302. March 12, 1929—Three or more revolving cylinders, covered on their inner surfaces with indentations, are mounted one above the other at a slight angle with the horizontal. Uncleaned grain is fed into the



first cylinder the indentations of which are shaped to receive the smallest grains to be separated. As the cylinder revolves the grains held in the indentations drop into a screw conveyor trough situated within the separating cylinder. The separator can be built in units to adapt it to varying quantities of grain.

* * *

Continuous Chewing Gum Machine—Theodore Bauer, Canajoharie, N. Y., assignor to Beech-Nut Packing Company, Canajoharie, N. Y. No. 1,700,-303. Jan. 29, 1929—Apparatus for continuous production of chewing gum which extrudes gum in a continuous mass, passing it through a pair of rollers to the curing elevator, then to a blast of dehydrated air. Next it passes through other rollers and is cut into sheets.

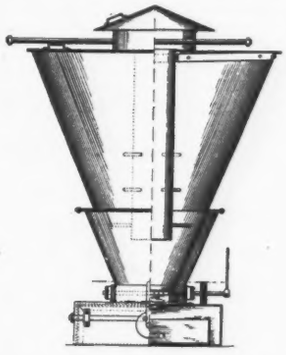


Continuous Chewing Gum Machine

Can Topper—George Flook, Syracuse, N. Y., assignor to Continental Can Co., New York. No. 1,702,111. Feb. 12, 1929—The topping device used on Continental Can Company's closing machine to press down the contents before sealing on the covers.

* * *

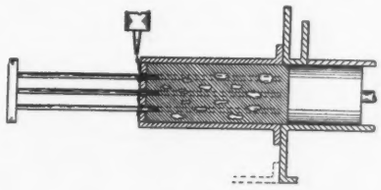
Smoke Box—J. E. Covey, Chicago, assignor to Swift & Co., Chicago. No. 1,694,163. Dec. 4, 1928—A smoke box in which sparks, soot and ashes are filtered out to avoid settling on meat in smoke rooms, is a conical device lined with fire brick, having a shaking grate in an air-tight ash pit. Stuffing boxes



prevent escape of gases around the grate bearings. The smoke-tube extends from the top down into the lower part of the cone. The box is started with live coals and filled with sawdust. Air under pressure is admitted to the ash pit. Slow combustion is controlled by the amount of air supplied. As fast as smoke is formed it passes upward through the sawdust which filters it.

* * *

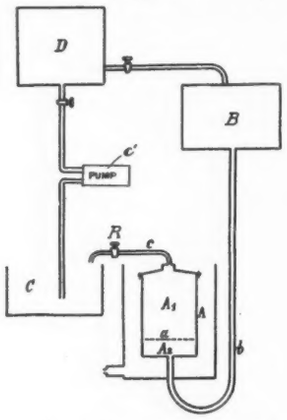
Method of Removing Gas Pockets from Dough—Arthur H. Tessin, Saginaw, Mich., assignor to Baker Perkins Company, Inc., Saginaw, Mich. No. 1,703,812. Feb. 26, 1929—Dough, in the dividing machine, is pierced by pointed



Gas Pocket Eliminator

metal rods lubricated with an edible oil. Gases, entrapped in the dough, escape along the rods and the plunger of the dividing machine forces fresh dough in to take the places of the gas pockets.

Process for the Manufacture of Preserved Fruit—Charles Fraisse, Cavaillon, France. No. 1,703,730. Feb. 26, 1929—A continuous syruping device for preserving fruit. Heavy syrup from B flows into A_2, through a porous membrane, *a*, into A_1 where it comes in contact with the fruit. The syrup, diluted by osmotic



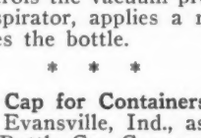
transfer of water from the fruit, overflows into C. A pump elevates it to a concentrator D from which it flows into B to repeat the cycle.

* * *

Bottle Evacuating Machine—David Robertson, Wellington, New Zealand, assignor to Vacuum Products, Limited, Wellington, New Zealand. No. 1,703,457. Feb. 26, 1929—A device for evacuating bottles of food products and sealing them under vacuum. A succession of movements of a pedal operates a valve which controls the vacuum produced by a water aspirator, applies a metal cap, and releases the bottle.

* * *

Friction Cap for Containers—August C. Spahn, Evansville, Ind., assignor to Bernardin Bottle Cap Company, Evansville, Ind. No. 1,703,501. Feb. 26, 1929—A friction cap with an annular grip-



ping bead and supplementary arc-shaped gripping surfaces for bottle necks not truly round. The annular bead also keeps the sealing disk in the cap when dry or not in use.

* * *

Manufacture of Fatty Acids—Hermann Weyland and Stanislaus Deichsel, Elberfeld, Germany, assignors, by mesne assignments, to Winthrop Chemical Company, New York, N. Y. No. 1,703,129. Feb. 26, 1929—A process for making edible fats derived from fatty acids having an odd number of carbon atoms. Raw fatty acids from cocoanut or palm oil are distilled under a pressure of 10 mm. The fraction boiling from 163-180 deg. C. is treated with glacial acetic acid and passed at 450 deg. C. over pumice stone impregnated with thorium oxide. The mixture of methyl ketones formed is distilled under 15 mm. pressure and the fraction boiling from 130-160 deg. C. is oxidized with sodium bichromate and sulphuric acid. The mixture of fatty acids formed by the oxidation is distilled under 10 mm. pressure and the fraction boiling at 140-170 deg. C. is esterified with glycerin. When the ester is neutralized and distilled with steam an odorless and tasteless fat melting at 25 deg. C. is the result.

* * *

Concentrated Salad Dressing in Solidified Form—W. D. Richardson and Roy C. Newton, Chicago, assignors by direct and mesne assignments of one-half to Swift & Co., Chicago, and one-half to Albert Musher, Washington, D. C., No. 1,701,084. Feb. 5, 1929—Concentrated salad dressing in which solid or semi-solid fats are mechanically mixed with the other ingredients without melting the fat. Ingredients, placed in a low temperature emulsifier, are kneaded under pressure and forced through fine perforations until a uniform mixture is obtained. When the solidified dressing is heated to the melting point of the fat, the product becomes an emulsion without fat separation.

The solid products may be cut or stamped into prints and marketed in paper cartons in the same manner as butter. For use in the home, a piece of the concentrated salad dressing is worked together with oil or water, or both.

Copies of Patents

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

Photostatic copies of foreign patents may be obtained at the same address, prices being forwarded on application.

Clarifying Cane Molasses for Yeast Culture—Charles Hoffman, Tuckahoe, N. Y., and Charles N. Frey and Frank Hildebrandt, Warren, Ohio, assignors, by mesne assignments, to the Fleischmann Company, New York, N. Y. No. 1,687,561. Oct. 16, 1928—Molasses, which is the cheapest and most abundant source of sugar for yeast culture, contains various impurities that are unfavorable to the growth of the yeast and discolor it, as well as impart an unpleasant flavor to yeast grown in this medium that is communicable to bread made with it.

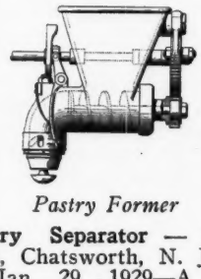
The theory of the method of clarification depends on the use of sodium silicate, which will remove from the molasses a number of its deleterious ingredients and also precipitate much of the colloidal material which prevents easy filtration.

* * *

Concentrated Ice Cream Mix Process—D. W. Fisher, Springfield, Mass., assignor to General Ice Cream Corporation, Schenectady, N. Y. No. 1,699,526. Jan. 22, 1929—A process of concentrating ice cream mix that can be preserved for a long period of time. The mix contains approximately 24 per cent fat, 21 per cent solids not fat, and 32 per cent sugar, totalling 77 per cent solids. Fresh cream is pasteurized and held in cold storage until used; fresh milk is cooled to below 50 deg. and before using is heated to 180 deg. F. in a continuous pasteurizer. Cane sugar and corn syrup are added to the hot milk and, after dissolving, the pasteurized cream is added and the temperature kept above 145 deg. F. In a half hour the mixture is drawn into a vacuum pan and concentrated by boiling in vacuum at 130 deg. F. The mix is then drawn off and placed in cold storage. The theory underlying the whole patent is keeping the osmotic pressure up to a point which will stop bacterial action.

* * *

Pastry Forming Machine—J. C. Bergner, Philadelphia, assignor of one-half to F. E. Morris, Philadelphia, Pa. No. 1,702,191. Feb. 12, 1929—Automatic machine for extruding and cutting pastry dough.



Pastry Former

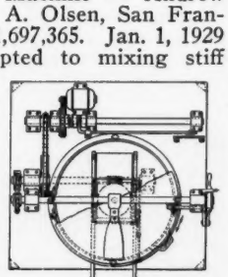
Cranberry Separator — David E. Applegate, Chatsworth, N. J. No. 1,700,302, Jan. 29, 1929—A cranberry picker which will remove unsound berries. It consists of four or five belts traveling horizontally, each adjacent belt successively lower than the preceding. Alternate belts travel in opposite directions. Suspended above the belts are zigzag baffles with their bottoms elevated slightly above the surface, so that berries on the moving belts will be moved toward the side nearest to the next lower unit. Solid berries will be rolled across the belt by the baffles while rotten and soft berries will be crushed and passed off the end of the machine.

* * *

Dehydrator—H. S. MacKaye, Yonkers, N. Y., assignor by mesne assignment to Dry Fresh Process, Inc., of New Jersey. No. 1,701,813. Feb. 12, 1929—A dehydrating apparatus in which a pan of water rests above the fire to moisten the hot gases sufficiently to prevent case-hardening in the earlier stages of dehydration.

* * *

Candy Making Machine — Andrew Olsen, Jr., and J. A. Olsen, San Francisco, Calif. No. 1,697,365. Jan. 1, 1929—A machine adapted to mixing stiff candy batches such as nut fudge or caramels. A heavy copper hemispherical bowl is mounted on a revolving platform with a horizontally revolving shaft above it. A paddle on the shaft stirs the batch as the bowl revolves oppositely underneath.



* * *

New Source of Galactose—H. F. Weiss, Madison, Wis., assignor, by mesne assignment, to Wood Conversion Company, Cloquet, Minn. No. 1,695,445. Dec. 18, 1928—A method of obtaining the sugar galactose in large quantities mixed with other sugar from the wood of the western larch. Upon acid-hydrolysis it yields as high as 29½ per cent of sugar, an amount much higher than the usual coniferous woods, which ordinarily yield around 20 to 22 per cent of sugar.

· WHAT'S · ON · YOUR · MIND? ·

An open forum for the exchange of opinion

Corn Sugar—That Honey Man's Opinion

To the Editor of "Food Industries":

The article in your April issue on corn sugar represented as having been written by a honey man contains so many errors, if not deliberate misrepresentations, that we hope you will be willing to correct them in your next issue.

To begin with, the writer of that article starts out by saying that he is one of the honey people, leaving the inference that he is a honey producer. The fact is that he is not now, and never has been, a honey producer. He cannot, therefore, in any sense speak for the honey producers of the country. This fact can be established in a manner to satisfy the highest court in the land, if necessary.

Your correspondent refers to the first telegrams that were sent out by *Gleanings in Bee Culture,* informing beekeepers of the proposed legislation especially exempting corn sugar from the requirements as to declaration on the label, imposed upon other food products by the Pure Food Law, as misrepresenting the facts. He says that the telegrams were violent warnings that the bill had already passed the Senate, and characterizes this as jumping at conclusions. He puts the date for the introduction of the first corn sugar bills as March 2, 1926. The bills were introduced earlier, and the Senate bill was passed in the Senate on Jan. 16, 1926, as S481. Such misrepresentation of facts should not be set forth as arguments in a controversial subject. The telegrams stated the truth, as anyone can verify by the records. He would also have your readers believe that the statement in this telegram that the bill as then written, if enacted into law, would permit the insertion of corn sugar in honey, was false. Before this statement was made to influential beekeepers, the editor of *Gleanings in Bee Culture* consulted the best legal talent available on this subject and was informed that this bill, if enacted into law, would permit the insertion of corn sugar into thin or unripe honey to prevent fermentation, and then the selling of the product as pure honey. The following statement by W. G. Campbell, director of regulatory work, U. S. Department of Agriculture, who is an authority on this subject, should be sufficient evidence that the action on the part of beekeepers in opposing the recent efforts to modify the Pure Food Law by making exceptions in favor of corn sugar was not a result of jumping at conclusions. In testifying before the committee on interstate and foreign commerce, Mr. Campbell said:

"It is probable that a concentrated solution of corn-sugar sirup added to honey would prevent that fermentation. Now, suppose that that was added in the amount of 50 per cent and suppose the resulting product was put on the market as honey. We would be absolutely estopped, as I interpret this amendment, in the department, in the enforcement of this law, from preventing them from marketing that as honey, when, in fact, it would be 50 per cent concentrated corn-sugar sirup. This is the significance of this statute." (Corn Sugar Hearing — 69th Congress, on H. R. 39, page 82.)

Your correspondent is also in error when he makes the general statement that the standards and definition under which the Pure Food Law is administered permit *cane sugar* to be used to sweeten and preserve foods without declaration on the label. If he actually believes what he says regarding this, let him try to preserve some unripe honey with cane sugar, then sell it as honey, and see what happens when the government chemists find it out. Such adulteration of honey was practiced previous to the enactment of the Pure Food Law and would be now if Mr. Willson's statement about cane sugar were true. The fact is, in the administration of the Pure Food Law, cane sugar does not enjoy any privileges not accorded to other food products. It must be declared when used in other food products in all cases except a very few, such as in making preserves or in canning, where the public understands it is used. The absence of a declaration in these few cases is equivalent to a declaration that cane sugar is used.

Those who would make a breach in the Pure Food Law by granting a special privilege to corn sugar not enjoyed by any other food product never fail to refer to the fact that cane sugar may legally be used by common consent in these few cases without declaration. If they really thought that they had a grievance here, why did they refuse to accept Secretary Jardine's proposal to settle the question by requiring that cane sugar or beet sugar be declared on the label, even in these few cases, and even though the public does understand that an absence of declaration is equivalent to a statement that it is present? This was proposed by Secretary Jardine, but was refused by the proponents of this legislation. What they want is a privilege not enjoyed by any other food product.

Mr. Willson sets forth the ridiculous theory which has already been worn threadbare in corn-sugar propaganda that the declaration of the ingredients on the label conveys the idea to the consuming public that the product contains some harmful or inferior ingredient. Most manufacturers of food products are anxious that their product be mentioned on the label when used as an ingredient in other food. They know that the best method of promoting a meritorious product is to have it mentioned whenever and wherever there is an excuse for doing so. They do not ask for legislation permitting them to hide it away in some other food products without letting the public know that it is there. Such methods in merchandising a meritorious product in these days of enlightenment would be the height of absurdity.

Your correspondent mentions levulose as also needing the proposed legislation. He need have no concern for levulose if it should ever be manufactured commercially as a food product. It is such a fine sugar that if it could be manufactured as a commercial food product the manufacturers would put forth every effort to have it mentioned wherever it could be used as an ingredient of other food products. All that honey producers, as well as all others who have opposed this proposed corn-sugar legislation, are asking is that the ingredients of all labeled food products be declared, so that the public will know what they are consuming.

Certain food products that have not as yet been standardized and that need not be labeled, such as bread, cake, pie, confection, and, in some states, ice cream, are mentioned by your correspondent in connection with standardized and labeled food products in a ridiculous effort to convince his readers that corn sugar is being discriminated against. Intelligent readers can readily see through such a flimsy argument.

If your correspondent knows it he does not mention the fact that standing shoulder to shoulder with the honey producers are preservers, canners, and packers of labeled pure foods of all kinds, whose very existence depends upon the Pure Food Law. Former Secretary of Agriculture Jardine was not against corn sugar, but he was against permitting indiscriminate use of corn sugar in labeled package goods without a declaration of the fact on the label. The American Farm Bureau Federation has been incorrectly quoted. That body has no quarrel with corn sugar (and neither has anyone else), but the Federation does not favor permitting it to be substituted without a mention of the fact on the label.

H. H. Root,
Associate Editor.
Gleanings in Bee Culture.

New Use for Glucose

The Color and Farm Waste Laboratory, U. S. Department of Agriculture, has developed molds which ferment glucose to gluconic acid used in dyeing and medicine.

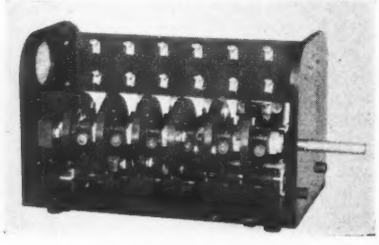
MANUFACTURERS' · NEWS · AND · EQUIPMENT

Limit and Master Switches

A new line of cam-operated, double-break master and limit switches is announced by General Electric. The limit switches bear the designation LS-429 and are expected to be of especial value on such applications as skip hoists, car dumpers, and other machines requiring geared type switches. The new master switches bear the designations C-3614 and C-3616, and are in general for the same type of service as the limit switches. They are at the present time available in one - point, three-point, and four-point switches.

Master Switch

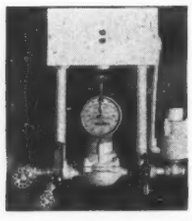
The limit switches can be adjusted by shifting, tripping and closing dogs on the cams. The contact mechanism is of the snap-action type and is latched in both the open and closed positions. This gives a positive action to the switch and also allows adjustment of the operating dogs to operate the contact mechanism through the entire 360 degrees of rotation.



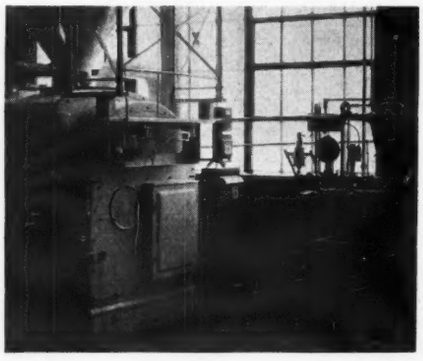
Limit Switch

Automatic Flow Control

Measurement of the volume of water and other liquids in food manufacturing plants is carried out in a number of ways, the least accurate of which is probably the measuring tank equipped with a gauge glass. Next in point of accuracy is probably the water scale, and the most accurate device developed thus far, the meter. As ordinarily handled, however, the meter requires manual control for starting and stopping the flow of liquid through it, and the accuracy of measurement of the amount of liquid used in a process is dependent upon the attention of the operator and his ability to shut it off at the correct point.

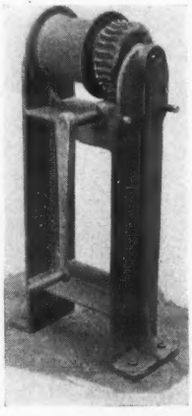


In the automatic flow controller recently developed by the Gottfried Automatic Flow Control Company, of New York, the liquid is shut off automatically and instantly after a predetermined amount has passed the meter. The apparatus is accurate to an amount of water as small as one pound, and where the volumes are fairly large such as those normally used in the baking industry—up to 400 or 500 lb.—the accuracy is $\frac{1}{4}$ of 1 per cent. Another feature of the Gottfried equipment is a thermostatic valve that predetermines the temperature of the water. Thus the operator sets two indicators, one for volume, the other for temperaure, and pushes a button to deliver a measured volume of water at a given temperature.



Floor Type Hand-Operated Winch

The Stephens-Adamson Mfg. Company, of Aurora, Ill., has developed a floor type, hand-operated winch in addition to its line of motor and hand winches. This winch is mounted on a cast iron stand, and has a cast iron worm gear which is self-locking, thus insuring the safety of the load at all times. The winch has a rope pull of 750 lb. at the drum. The cast iron drum, which is 6 in. in diameter, has a capacity of 100 ft. of $\frac{1}{4}$-in. cable and 60 ft. of $\frac{3}{8}$-in. flexible wire cable.

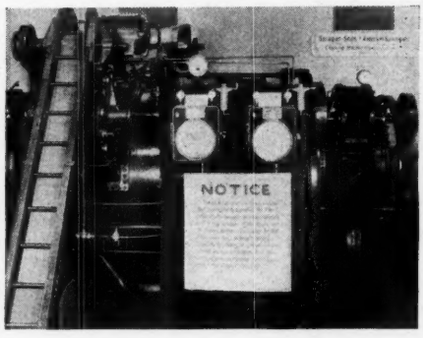


Floor Type Hand Operated Winch

Laboratory Model of Continuous Pressure Cooker

The continuous pressure cookers of the Anderson-Barngrover division of the John Bean Manufacturing Company, San Jose, Calif., offer so many possibilities to the canning industry and involve such modifications of the canning technology as are occasioned by the greater rapidity of heat penetration possible in the continuous cooker, that much research on them has been carried out and much more remains to be done. This is, in part, due to the desirability of studying the behavior of any product during sterilization by this method. The plant size cooker is a machine so large that a laboratory model for experimental purposes has been constructed that will embody in a smaller machine all of the possible features that can be obtained by a combination of the equipment of a size suitable for factory production.

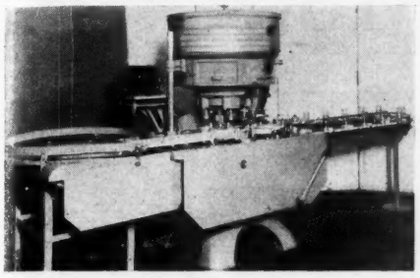
Despite the fact that the model machine is of laboratory size, it weighs nine tons and is roughly 8 ft. high. Facilities are provided in this special experimental equipment for cooking under factory conditions, any size of cans from No. 1 to No. 10, with either agitating or non-agitating cooking or cooling. Two duplicate experimental cookers have been built at a cost of over $20,000, one of which has been donated to the Research Department of the American Can Company, Maywood, Ill., and the other to the Research Department of the Continental Can Company, Chicago. No strings are attached to these donations. Their sole function is to enable users of cans to study the behavior of their products in this style of cooker.



Full Automatic High Speed Crowner

A full automatic, high speed, four head, rotary machine for applying Axa crown caps to glass jars is a recent offering of the Crown Cork and Seal Company, Baltimore. Its speed of 65 to 75 jars per minute is faster than any of the automatic fillers that might be used

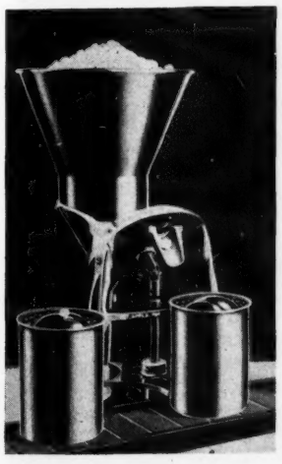
in conjunction with it on the same packing line. Crowns from the large hopper atop the machine are automatically



fed and placed on the jars. A feature of the machine is the revolving accumulative take-off table, seen at the left side of the machine, on which the crowned containers may accumulate temporarily for the convenience of the operator who is packing them into cases.

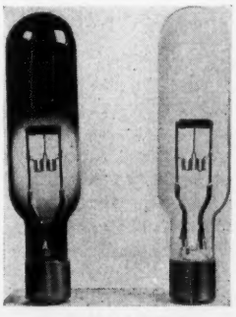
Salt Depositing Machine

A machine, for automatically salting cans or glass jars of vegetables while they pass on a conveyor, called the Scienco Salt Depositing Machine, is offered by the Scientific Tablet Company, of Belleville, Ill. The salt is provided in the form of tablets of uniform size whose weight may be specified. As the containers to be salted pass by the machine a star wheel is turned that causes a single tablet from the hopper to be deposited therein. The machines are leased.



Reviving Dirty Lights

A new type of high-powered incandescent lamp has been developed by General Electric Company in which it is possible to clean the *inside* of the bulb without ruining the light. This is accomplished by leaving inside a little coarse tungsten powder that sweeps off the "soot" deposit when the lamp is shaken.



In the illustration the lamp at the left shows the darkening occurring after prolonged use and (right) how it may be cleaned.

Manufacturers' Latest Publications

Barometric Condensers. Chicago Pneumatic Tool Company, New York, N. Y.—Catalog No. 718, describing and illustrating barometric condensers, air pumps and water pumps.

Rotary Pumps. Geo. D. Roper Corporation, Rockford, Ill.—Catalog 54. Illustrations, descriptions, specifications and performance tables for Trahern rotary pumps.

Mixing Equipment. Mixing Equipment Company, Inc., 229 East 38th St., New York. — Folder describing the lightning portable electric mixers for stirring liquids.

Speed Reducers. Gears & Forgings, Inc., Cleveland, Ohio. — Bulletin C, describing worm gear speed reducers of several types where moderate power at large ratios is to be transmitted. Thirty pages of data.

Electrical Equipment. Larkin & Jennys, 30 Broad St., New York.—A financial review of the possibilities and progress of the Crocker-Wheeler Electric Manufacturing Company, of Milwaukee, showing major equipment, balance sheets, and some of the larger customers.

Instruments. The Impact Register Company, Champaign, Ill. — Folder describing the results obtained by employing Savage impact registers to indicate the rough handling of freight cars. The instrument is placed in the freight car and records all severe jolts on a moving sheet of paper.

Speed Reducers. Gears & Forgings, Inc., Cleveland, Ohio.—Bulletin B, describing planetary speed reducers for direct drive, angle drive, and vertical drive. Capacities from ½ hp. to 75 hp. Dimensions of all sizes given. In addition, type B speed reducers from 1 hp. to 25 hp. are described, together with their respective dimensions.

Centrifuges. International Equipment Company, Boston, Mass.—Bulletin C1, describing International Centrifuges, type SB and type C.—Bulletin C2, describing size two centrifuges. "The Centrifuge as a Time-Saver in Pharmaceutical Analysis" by George E. Ewe. Reprint from *The Practical Druggist,* October, 1922.

Variable Speed Transmission. The Reeves Pulley Company, Columbus, Ind. —A profusely illustrated booklet describing the needs for variable speed transmission, entitled "The Modern Need for Infinite Speed Adjustability." Illustrations and descriptions of Reeves transmissions in plants of the General Baking Corporation, Kingan & Company, meat packers; Quaker Oats Company, Muffets baking; and 12 other concerns not engaged in food manufacture.

Automatic Valve Control. The Cutler-Hammer Manufacturing Company, Milwaukee, Wis. — Bulletin CE-1 describing Cutler-Hammer valve control. Description of applications in industry for the motor driving of valves of various types and sizes, particularly the larger sizes, also method of operating remote and inaccessible valves.

Tramrail. Cleveland Electric Tramrail, Wickliffe, Ohio.—Folder describing the Cleveland tramrail system in bakeries.

Electrical Equipment. General Electric Company, Schenectady. Bulletin GEA-1031A, describing GE type AW resistor arc welders.

Heaters, Unit. Buffalo Forge Company, Buffalo, N. Y.—Four-page folder describing lowboy and highboy heaters for industrial establishments.

Canning. William Underwood Company, 52 Fulton St., Boston, Mass. — Book entitled "The Second Century," giving the history of the house of Underwood from its origin up to date. Profusely illustrated.

Sugar. The Southern Sugar Company, 645 North Michigan Ave., Chicago.—Story of the operations of the Southern Sugar Company in Florida up to 1929, describing the agricultural developments which have paralleled industrial progress.

Thermometers. Taylor Instrument Company, Rochester, N. Y.—Catalog Part 8,000 gives descriptions and prices of recording thermometers, recording pressure and vacuum gages, and index thermometers. Part 100 gives similar information on indicating thermometers.

Labeling Machines. The Fred H. Knapp Corporation, Ridgewood, N. J. —Folder describing the 1929 type of Knapp labeling machine, which embodies the interesting forced feed pasting device in which a tube and pump take the place of the paste belt. Also Knapp casing machines.

Pulverizing Machinery. Pulverizing Machinery Company, 30 Church St., New York City.—Bulletin describing micro-pulverizer, which is dustless and yields 100 per cent recovery. Operates on both hard and soft, dry, plastic, gummy, unctuous, fibrous, and low melting point materials. Description of apparatus pulverizing sugar at 4,000 lb. per hour with 99 per cent passing through 100-mesh screen.

Mixing Equipment. Robertson Manufacturing Company, Muncy, Pa.—Bulletin 32-B, describing Gardner and Unique mixers. Forty-four pages devoted to cisterns and mixers in various combinations; liquid mixers, both vertical and horizontal; special mixers for handling extremely fine materials that have a tendency to lump, such as pulverized sugar, cocoa, milk powder and the like; mixers with steam jackets; mixers with elevators; continuous mixers.

Filters. Seitz - Works, Kreuznach, Rheinland, Germany.—English edition of a German catalog. Description of Seitz filters for treatment of wine, food and beverages such as cider, fruit juice, vinegar, condiments, vegetable oils, water, etc. The sterilizing filter of commercial size is also described. Other apparatus for the beverage industry such as fillers, bottle washers, sterilizers, etc., are included. Philipp Wirth, 31 Union Square, New York, agent.

· NEWS · ITEMS ·

New Dairy Company in Southeast

Foremost Dairy Products, Incorporated, recently organzed, has acquired 15 dairy and ice cream companies serving the larger cities of the southeastern United States, including Atlanta, Birmingham, Savannah, Jacksonville, Fla., and Tampa. The new company is offering for sale 125,000 units, each unit consisting of one share of convertible preference stock (no par value) and one-half share of common stock (no par value), in connection with the acquisition of the properties of the company. The units plus accrued dividend are priced at $29 and are being sold through George M. Forman & Company, and Moore, Leonard & Lynch, both of New York City. The physical properties acquired by the company have been appraised at $3,459,255.

Officers of Foremost Dairy Products, Inc., are: J. C. Penney, founder of the J. C. Penney Company, chairman of the board; Burdette G. Lewis, president; Hugo J. Larsen, vice-president in charge of operations; George Sancken, vice-president; and Arthur L. Lund, treasurer.

Another Manufacturer of Carbon Dioxide Ice

The interesting information is gleaned from the annual report of the National Distillers Company that it has acquired a substantial interest in the Solid Carbon Dioxide Company, Ltd., and that the latter has built a plant adjacent to that of its subsidiary, Eastern Alcohol Company, Deepwater Point, N. J., for the purpose of manufacturing the refrigerant from the waste gases of fermentation.

It is understood that National will also manufacture glycerine by the fermentation of molasses.

Tri-State Canners Study Grading of Canned Foods

The spring meeting of the Tri-State Packers' Association, Inc., was held April 3 and 4 at the Lord Baltimore Hotel in Baltimore. Significant results were obtained during the first session devoted to grading canned corn, peas, snap beans, lima beans, and tomatoes by the use of scoring methods. Many of the samples examined had been purchased at retail and carried private labels that bore designations of grades. Two cans of tomatoes bearing the fancy grade declaration were found to be woefully misdeclared, for one of them proved to be substandard and the other a low standard.

Methods of controlling the Mexican Bean Beetle were discussed by Dr. Neale P. Howard, of the Bureau of Entomology, U. S. Department of Agriculture. S. O. Neal stressed the importance of better use of the space on can labels, stating that this possibility of advertising the goods was entirely neglected by many canners.

Adolf Gobel Expansion

The 1928 financial report of Adolf Gobel, Inc., shows that in 1928 the company has acquired through purchase for cash or exchange of stock, controlling interest in the Howard Provision Co., New York; Playland Refreshment Corporations, Rye Beach, N. Y.; B. Meier & Son, Inc., New York; A. Laffler Provision Co., Benning, D. C.; T. T. Keane Co., and the Keane Provision Co., of Washington, D. C.; Hertz Bros., Milton, Pa.; Merkel, Inc., Jamaica, N. Y.; C. Lehman Packing Co., Brooklyn, N. Y.; and the United Sausage Co., Boston. In the early part of 1929 Gobel acquired Jacob Decker & Sons, of Mason City, Ia.

Directors of the Gobel Company are Frank M. Firor, F. Howard Firor, William J. Hammerslough, Rodney Hitt, Henry Merkel, George W. Spence, Ralph D. Ward and George K. Morrow.

COMING EVENTS

MAY

1-3—Glass Container Association, Atlantic City.
2-3—American Institute of Refrigeration, Washington, D. C.
4—Minneapolis District, Association of Operative Millers.
6-8—Associated Bakers of America, Buffalo.
6-9—Southern Bakers Association, New Orleans.
6-10—Annual Convention, American Association Association of Cereal Chemists, Kansas City, Mo.
6-11—Chemical Industries Exposition, New York City.
9-10—Indiana Canners Association, Indianapolis.
13-14—New York Association of Manufacturing Retail Bakers, Buffalo.
13-14—Annual Convention American Oil Chemists Society, New Orleans.
14-16—Iowa Bakers Association, Cedar Rapids.
19-21—New England Bakers Association, Swampscott, Mass.
20-22—Missouri Master Bakers Association, Kansas City.

JUNE

3-4—South Dakota Bakers Unit, Watertown.
3-8—Annual Convention, Association of Operative Millers, St. Louis.
3-8—National Confectioners Association, West Baden, Ind.
6-8—Annual Convention American Feed Manufacturers Association, French Lick, Ind.
10-12—Pennsylvania Bakers Association, Bedford Springs.
17-19—Potomac States Bakers Association, Virginia Beach, Va.
17-19—Associated Bakers of Minnesota, St. Paul.
18-20—National Macaroni Association, New York City.
18-20—American Dairy Science Association, Washington, D. C.

AUGUST

17—Missouri-Illinois District, Association of Operative Millers, St. Louis.

Birdseye Process for Frozen Fruits

"Frosted" loganberries, strawberries and red raspberries are being packed in 1-lb. paper containers by Ray-Maling Company, Inc., Hillsboro, Ore. The fruit is frozen in Birdseye equipment which gives the quick freeze in a continuous process similar to the quick freezing of filleted fish.

Borden Acquires Walker-Gordon

The Borden Company is to acquire the assets and business of the Walker-Gordon Milk Company whose acidophilus cultured milk has long been distributed by Borden. The purchase will be made by an exchange of stock, according to a recent announcement. Henry W. Jeffers will continue as head of Walker-Gordon.

Toddy, Inc., Moves

The factory and accounting offices of Toddy, Inc., have been moved to 8 Jay Street, Rochester, N. Y. The sales office is at 522 Fifth Avenue, New York.

Royal Baking Company Acquires Interest in Chase & Sanborn

Affiliation of Chase & Sanborn with Royal Baking Powder Company is announced. Chase & Sanborn, operated as a close partnership for over 50 years, is to be incorporated; Royal Baking to acquire a substantial interest in the new corporation. Donald K. David, executive vice-president of the Royal company, has been asked to become the president of the new company, but will retain his office and activities with Royal. As soon as the necessary legal steps have been taken the new affiliation will become effective. No new financing is contemplated by either company.

Farm Relief Bills Presented to Congress

Proposed Federal Farm Board Act Lacks Production Control Mandate

By Paul Wooton
Washington Correspondent

AFTER having taken many volumes of testimony and after having discussed farm relief for several years, the committees of Congress apparently are not ready to prescribe specifically for the ills of agriculture. The House bill, generally regarded as the superior of the two, does little more than propose the creation of a federal farm board. It suggests the appropriation of $500,000,000 to do anything that anyone has thought of in the way of farm relief, with the sole exception of fixing prices. Little in the bill is mandatory. Practically everything is left to the board's discretion.

There is strong support in the Senate for the debenture plan of handling exportable surpluses. This is certain to meet with strong opposition on the ground that no scheme is sound that enhances the price and does not control production. Since it is evident that the Federal Government has no thought of assuming control over production, there seems little prospect for attaching the debenture feature of the Senate bill to the law which finally will be enacted.

Many legislators seem to have lost sight of a primary fact. A very small increase in the total production of a crop may mean a very large increase in exports. For instance, exports might be only five per cent, but it would require only a slight increase in the total production to increase exports by five per cent, which would mean doubling the amount thrown upon the world markets which usually are well supplied already.

House Outlines Relief Policy

As this is written, there seems to be little opposition to the organization of a farm board along the lines indicated in the House bill. Some unfavorable comment is coming from the co-operatives, who fear that they may be brought under federal control, and the middlemen generally see in this legislation a threat against their institutions which, they declare, have grown up slowly and stably and have behind them centuries of experience. There is very general concurrence in the declaration of policy which is regarded as having been happily worded by the House committee as follows:

"It is hereby declared to be the policy of Congress to promote the effective merchandising of agricultural commodities in interstate and foreign commerce, so that the industry of agriculture will be placed on a basis of economic equality with other industries; and to that end to protect, control, and stabilize the current of interstate and foreign commerce in the marketing of agricultural commodities and their food product by minimizing speculation, preventing inefficient and wasteful methods of distribution, and limiting undue and excessive price fluctuations; by encouraging the organization of producers into co-operative associations and promoting the establishment and financing of a farm marketing system of producer-owned and producer-controlled co-operative associations and other agencies; and by aiding in preventing and controlling surpluses in any agricultural commodity, through orderly production and distribution, so as to maintain advantageous domestic markets and prevent such surpluses from unduly depressing prices for the commodity."

A feature of the bill which excites great interest in Washington, at least, is the provision under which the President may transfer to the farm board any bureau or other government agency. This is thought to foreshadow the absorption by the board of the Bureau of Agricultural Economics of the Department of Agriculture.

Coffee To Be Advertised

A movement is on foot within the coffee industry to resort to advertising. It long has been the idea in that trade that coffee is so generally used that advertising, outside of the activities of the producers of the individual brands, would be a waste of money. Now it is realized that other beverages are flourishing in a field in which coffee might have been the leader and that coffee is beginning to feel the inroads made by its competitors. One of the most promising fields open to the coffee trade is thought to be the popularization of iced coffee. Were iced coffee to be used to the same extent as iced tea it would have an important bearing on the demand. It also is recognized that there is a general lack of knowledge of what can be done with coffee beyond the common forms of its preparation. It is claimed that there are few ramifications in the beverage field into which coffee may not enter successfully. The succcess which has attended the advertising of cocoa is one of the influences tending to induce the coffee trade to follow in the same course. The Brazilian coffee growers are in particular difficulty this year because of the large pending crop coming on top of a very considerable carryover. This is subjecting their financial organization to great strain at a time when coffee roasters are turning more and more to the mild coffees of other countries.

Peanuts May Not Benefit by Tariff Increase

If the peanut growers are to benefit from the 50-percent tariff increase granted last February by President Coolidge, officials in Washington point out that more of the larger varieties must be grown in this country. Otherwise it is obvious that Chinese nuts will continue to come in over the tariff wall to fill the deficiency in these sizes. It is to be expected that at least part of the 2c. per pound duty increase will reflect in the price of large Virginia peanuts. However, if the Virginia farmer increases his planting with the expectation of realizing on the tariff aid, it is foreseen that, under present farming methods, the yield of the smaller sizes of shelled peanuts, for which the tariff creates no greater demand, would correspondingly increase. This glut would tend to depress the price on small kernels so that the net return on a farmer's total crop might be even less than under the old duties. The Department of Agriculture is urging careful selection of seed and fertilizer to insure that a sufficient portion of the crop will be in large sizes.

Flour Exports Increasing

Exports of flour to Africa and to Asia continue to increase. This is looked upon in Washington as a positive indication that the policy of American millers to devote more sales effort to the so-called backward countries, rather than concentrating so much attention on the highly competitive markets in Europe, is bearing fruit. So much has been done there to encourage expansion of milling that trade promotion is certain to be increasingly difficult. Because of the improved economic situation in most of the countries of Africa the per capita consumption of flour has increased decidedly. There is every reason to believe that progress of that character will continue.

Honey in Good Position

The honey crop is more nearly cleaned up this spring than in any year since the World War, it is shown by reports of the Department of Agriculture. This is very encouraging for the bee keepers, although it is pointed out that honey packers may have difficulty in getting the quantity and quality desired unless immediate orders are placed. Most of the stocks now remaining are in the poorer grades, being dark colored or partly fermented. Practically no high grade honey is left in surplus. Some of the large packers are already contracting for the 1929 crop which is unusual this early in the year.

Vitamin B a Complex

As a result of recent tests by Hazel E. Munsell of the Bureau of Home Economics, the thermo-labile component of Vitamin B, as well as the thermo-stabile factor, is shown to be growth promoting. This finding bears out the opinion that old methods of determining the Vitamin B content of foods are open to revision. Miss Munsell's experiments showed that rice polishings are an important source of Vitamin B, furnishing more of the thermo-labile factor required by the rat for optimum growth than was obtained from brewers' yeast. The relative effect of the thermo-stabile from rice polishings was less than that of yeast.

Bakery Engineers Stress Value of Standardization and Co-operation

Sixth Annual Meeting of National Society, Held in Chicago, March 25 to 28, Notable for Attendance and Interest in Technical Sessions

By Robert Gordon Gould
Managing Editor

WHEN George W. Tassie, president of the American Society of Bakery Engineers, formally opened the first session of the sixth annual meeting of the society at 11 o'clock Monday morning, March 25, at the Edgewater Beach Hotel, Chicago, there were in attendance 350 bakery engineers. A total of 491 members of the Society registering at the hotel during the four-day session, as was made evident by slightly increased attendance at some of the subsequent meetings.

As is customary with this body, the opening was signalized by excellent chorus singing, led by E. T. Clissold, of *Bakers' Helper*. Then followed an invocation by the Rev. Jacob Pister, of Chicago, who, appropriately enough, made use of the Lord's Prayer as a preliminary to a meeting of men engaged in the manufacture of the staff of life.

The president's address stressed the value that may be gained by members who attend meetings of this sort, emphasizing the need of giving generously from one's stock of knowledge if adequate return in the way of valuable information is to be expected from one's fellow members. He reported a very successful year, due principally to the cordial spirit of co-operation that exists among the membership.

President Henry Stude of the American Bakers Association, representing the bakers of America in a manner similar to that in which the Society represents their production departments, told something of the work during the past year of his Association and of the contemplated program for the ensuing year. These topics included business ethics, a national advertising campaign, and the formation of a Baking Council. In connection with the advertising campaign he stated that, in his opinion, the quality of the article advertised determines the success of any advertising campaign, and he sought the co-operation of his audience in making successful the forthcoming advertising of the bakers.

Next the engineers were addressed by James Parry, president of the Allied Trades of the Baking Industry, who similarly laid emphasis upon the need of high-quality products in view of the lively competition in which the wholesale bakers find themselves.

Shortly before this annual meeting the program committee, working through the Executive Secretary, Victor E. Marx, had taken up the subject matter of the forthcoming meeting, by means of questionnaires sent to the members generally, action that explains at least in part the very lively and enlightening discussion that followed the announcement of each new topic. Considered collectively, the subjects for discussion included materials, products (with special reference to cake), processes, shop maintenance, and equipment. For example, in connection with cake, the members had been requested to lay before the meeting their ideas as to: the developments and possibilities of the cake business as an addition to commercial bread making, the organization of a cake department, cake varieties and classifications, an equipment layout for an efficiently operated cake department, raw materials, cake flour, costs and profits, and any further points that might occur to them.

Equally detailed questionnaires had been sent on Materials, Formulas, Processes, and Variety Breads, on Shop Organization, on Equipment, with a special bulletin on standards for the several pieces of equipment used in the mixing room of the modern bakeshops. Because of the general interest in standardization, these standards are included herewith.

As a consequence of this carefully prepared preliminary work the leader of each day's discussion was supplied with ample material for questions and answers, the latter coming either from the special committees which had previously been appointed to assume responsibility for each general topic of discussion or from individuals called upon to make answers to the queries as they were presented by the chairman or by the leader of the discussion.

A typical question brought to light by the questionnaires and answered from the floor was "How best may organization morale be created and maintained?" the answer to which took the general form of "Set your employees a good example, choose your employees carefully, promote from within, and meet frequently in small informal groups for the airing of any possible grievances." Another question of more than ordinary interest was "Couldn't we have a clock on a peel oven that would ring when the bread is baked?" a query that called for a certain amount of levity, but one which, after all, is presumably well within the realm of the possible in these days of photocell control.

The Hon. Ellwood M. Rabenold, of New York City, spoke on the subject of "What Is Behind the Nation's Bread," this address emphasizing the need of effective work in lowering distribution costs.

Dr. H. E. Barnard, of Indianapolis, presented an illuminated copy of "The Engineers' Creed," being a statement of the professional ethics of the engineers as a group. During the course of the meeting, the creed was adopted by unanimous vote.

Walter Fleisher, of the Cooling & Air Conditioning Corporation, New York City, delivered an address on bread cooling, pleading for extension of air conditioning from the fermenting room, where it is now in use by many progressive bakers, to other parts of the shop. Particularly did he stress the need of cooling the air in the make-up room and the baked load. Mr. Fleisher characterized present-day air control in the bakeshop as an instance of piecemeal solution of a problem that would in all probability yield to intelligent analysis based upon regarding the bakeshop as an entity and providing air conditioning equipment for the entire establishment in very much the same fashion as such buildings are now heated

Standards Adopted by A. S. B. E. in Co-Operation with B. E. M. A.

High-Speed Dough Mixers

Maximum Dough per Batch, Pounds	Maximum Height Permitted	Minimum Ingredient Opening	Minimum Flour Opening	Minimum Water Opening	Minimum Height from Floor to Lip of Tub When Fully Dumped	Jacket Water Pressure, Pounds,	Jacket Opening
180	5′—10″	6″ x 12″	12″ dia.	3″ dia.	28″	25	1¼″
250	5′—10″	6″ x 12″	12″ dia.	3″ dia.	28″	25	1¼″
360	5′—10″	6″ x 12″	12″ dia.	3″ dia.	28″	25	1¼″
500	6′— 4″	6″ x 12″	12″ dia.	3″ dia.	28″	25	1¼″
650	6′— 8″	6″ x 12″	12″ dia.	3″ dia.	28″	25	1¼″
800	7′— 2″	8″ x 14″	12″ dia.	3″ dia.	28″	25	1¼″
1,000	7′— 9″	8″ x 14″	12″ dia.	3″ dia.	28″	25	1¼″
1,300	7′— 9″	8″ x 14″	12″ dia.	3″ dia.	28″	25	1¼″
1,600	7′—10″	8″ x 14″	12″ dia.	3″ dia.	28″	25	1¼″

Flour Handling Units

Dump Bins		*Blending Bins*		*Storage Bins*	
Maximum Dumping Height	Volume per 100 Lb. Unsifted Flour	Maximum Dumping Height	Volume per 100 Lb. Unsifted Flour	Volume per 100 Lb. Unsifted Flour	Volume per 100 Lb. Sifted Flour
38″	4,000 Cu.In.	38″	4,500 Cu.In.	4,000 Cu.In.	4,500 Cu.In.

Sifters and Rolters

Capacity	Mesh of Screen Over Storage Bin	Mesh of Screen Over Hopper
100 Lb. and Up in Sequence of 50 Lb.	Not Coarser Than 6 Mesh or Equivalent	Not Coarser Than 12 Mesh or Equivalent

Flour Hoppers

Minimum Angle	Shape	Material	Capacity
54°	Round	Non-Corrosive Metal	4,500 Cu.In. per 100 Lb. Sifted Flour

Water Tanks

Minimum Angle	Shape	Material	Capacity
Straight	Round	Non-Corrosive Metal	28 Cu.In. per Lb. of Water

and ventilated. He admitted that at present the matter of added expense is regarded as prohibitive, but felt sure the future would find the bakers ready to make the needed investment, an investment that, in his opinion, would be well repaid by improved quality of product.

The result of an experiment conducted by the research and experiments committee of the Society previous to the meeting and covering a definitive comparison of the flavor of breads made with sweetened condensed skim milk and that made with dried skim milk, was presented by W. J. Ocken and I. A. Berg, both of Chicago. According to experimentation conducted by members impartially throughout the country and collated and interpreted by the staff, it seems impossible to detect any difference in flavor in samples of bread made with the two contrasted ingredients.

All of Wednesday was devoted to a discusison of cakes and cake mixes. The chairman for the day, M. Cavenagh, of Minneapolis, recited the fact that the bakers had standardized commercial bread fairly well but that such was not the fact with cake, although standardization of bakeshop cakes that would be entirely satisfactory to the consumer was, in the opinion of the speaker, well wthin the powers of the bakery engineer. After a historical review of cake baking by T. E. Carl, of New York City, a classification of cake was offered by Charles Glabau, of *Bakers Weekly*, who prefaced his remarks with the statement that unfortunately there are no strict definitions of the various forms of cake now on the American market, there being about as many cakes as there are bakers offering them to the public. His suggested varieties were (1) pound cake, (2) loaf cake, (3) foam cakes of various sorts, (4) sweetened biscuits, (5) pastes.

Despite the fact that the modern commercial cake is not fully standardized, it is evident that the essential factors of cake manufacture are well in hand, as is evidenced by the fact that in discussing cakes containing molasses, Mr. Glabau mentioned that the flavor varies with the pH number of the baked cake, a statement that called for no explanatory details from any one present.

Layouts of various sizes for cake departments in existent bakeshops were presented by W. W. Reece, of Chicago, who emphasized the fact that the investment turnover in cakes was about twice that now obtaining in bread making.

Other addresses on the topic of cake were delivered by E. F. Hoban, of St. Paul, a more than ordinarily successful cake manufacturer; Dr. M. B. Graff, of Cincinnati, Mary M. Brooke, of Chicago, and A. T. Downie, of New York City, whose address on cost control and unit accounting covered the points necessarily considered in connection with the installation and operation of a cake baking department.

In addition to the foregoing there was much in the way of entertainment during the course of the convention, including a get-together dollar dinner the first noon, a banquet on Tuesday evening, and inspection trips to points of interest in Chicago on Thursday afternoon.

Officers for the ensuing year are: President, Gordon H. Darnell, Mutual Bakery, 255 Twelfth St., San Francisco; first vice-president, W. J. Ocken, Schulze Baking Company, 1257 West 97th St., Chicago; second vice-president, Paul Chapman, Edward Katzinger Company, Cicero and Armitage Sts., Chicago; secretary, Victor E. Marx, 1135 Fullerton Ave., Chicago.

Glidden Enters Food Field

The Glidden Company, of Cleveland, manufacturers of paints, varnishes, colors and insecticides, has entered the food manufacturing field, according to a recent letter to stockholders by Adrian D. Joyce, president. By the purchase of a number of going concerns, the Glidden company is now doing a food business of approximately $13,000,000 per year in addition to its business in other lines. The firms purchased were: Voco Nut Oil Products, Inc., which imports copra from the Philippine Islands and Dutch East Indies for crushing and oil refining; the Troco Company of Illinois, manufacturers of nut margarin, in which it is planned to manufacture 2,000,000 pounds of margarin per month by consolidation of this business with that of the Glidden Food Products Company; the Wisconsin Food Products Company with dairy plants at Jefferson, Wis., and Norwalk, Ohio; and the Dunham Manufacturing Company, of Brooklyn, N. Y., manufacturers of packaged shredded cocoanut.

The Metals Refining Company, of Hammond, Ind., was also purchased as an addition to the Euston Lead Company, a Glidden subsidiary manufacturing white lead.

The increase of common stock from 500,000 to 600,000 shares recently authorized, is to be sold to stockholders, in the ratio of one for five, at $35 per share. The sale of new stock is to reimburse the company's treasury for the cash outlay for the new plants.

M.I.T. Students Visit Food Plants

The Massachusetts Institute of Technology has a course of studies devoted to subjects of special importance to the food manufacturing industries. This four-year course, known as the option in Industrial Biology in the Department of Biology and Public Health, stresses in the third and fourth years the problems of food supply and the technology of food products, with special reference to the methods of food preservation.

During the week of April 15th ten seniors in the Food Technology courses spent their spring vacation in a trip to Canajoharie, Syracuse, Rochester, Buffalo and Niagara Falls to inspect plants of some of the representative food industries in that section. Among the plants they visited were those of the Merrell-Soule Company, Syracuse, the Beechnut Packing Company, Canajoharie and Rochester, the Jacob Dold Packing Company, Buffalo, the Washburn-Crosby Flour Mills, Buffalo, and the Shredded Wheat Company, Niagara Falls. The group was under the direction of Prof. Samuel C. Prescott, head of the Department of Biology and Public Health at M.I.T., and Dr. Bernard E. Proctor.

Illinois Glass—Owens Bottle Merger

The Illinois Glass Company, Alton, Illinois, and the Owens Bottle Company, Toledo, Ohio, have signed a contract subject to approval by stockholders, for the merger of the two companies and their subsidiaries. The new company is to be known as the Owens-Illinois Glass Company with general offices at Toledo, Ohio. The president of the new company will be W. H. Boshart, now president and general manager of the Owens Bottle Company. William E. Levis, president of the Illinois Glass Company, will be first vice-president and general manager.

The Owens company has 807,000 shares of stock outstanding, with a market value of approximately $75,000,000, at present prices, and assets valued at $36,000,000. The Illinois company has assets of $20,000,000 but the market value of its securities is greatly in excess of that amount. The combined market value of the securities of the two companies at present prices is probably over $100,000,000.

Subsidiary companies included in the merger are: The Chicago Heights Bottle Company, Chicago Heights, Illinois; The Carlyle Paper Company, Carlyle, Illinois; the Tavern Rock Sand and Gravel Company with plants in Missouri and New Jersey; and the Madison Warehouse Company, Boston.

Kraft-Phenix Continues to Expand

The following companies have been acquired lately by the Kraft-Phenix Cheese Company, according to recent announcements: E. W. Coon Company, Philadelphia; Peacock Cheese Company, Sheboygan, Wis.; S. J. Stevens Company; Sheboygan Cheese Company; Broadhead Cheese & Cold Storage Company; Wittenberg and Birnamwood Creamery Companies; R. M. Mills Company, Watertown, N. Y.; St. Lawrence Milk Company, Massena, N. Y.; Potsdam Creamery Company, Potsdam, N. Y., and Badger Cheese Company, Monroe, Wis.

The annual business of these additions to the Kraft-Phenix Company amounts to $7,500,000.

PERSONALS

A. WATSON ARMOUR, vice-president of Armour & Company since 1914, has resigned on account of ill health. He will remain a director of the company.

LEWIS H. BROWN was elected president of the Johns-Manville Corporation at a meeting of the Board of Directors held March 15. Mr. Brown succeeds Theodore F. Merseles, who died March 6. William R. Seigle, formerly vice-president in charge of mines and factories, was eleected chairman of the Board of Directors to succeed H. E. Manville, resigned.

JAMES O. CLARKE, chief of the New York Station of the Eastern District of the Food, Drug and Insecticide Administration since 1926, has been promoted to chief of the Central District of the bureau with headquarters at Chicago. Mr. Clarke succeeds E. H. Goodnow, resigned. Joseph Callaway, Jr., director of drug analytical work at the New York Station of the bureau will succeed Mr. Clarke as chief of that station.

H. M. CONWAY, livestock economist, Bureau of Agricultural Economics, United States Department of Agriculture, has resigned to take charge of the economic research department of the National Live Stock Producers Association.

ARTHUR W. FARRALL, formerly of the Dairy and Agricultural Divisions of the University of California, Davis, Calif., is now in charge of experimental work on drying food products and the development of new dairy machinery for the Douthitt Engineering Company, Chicago.

WILLIAM E. LEVIS, former President of the Illinois Glass Company, Alton, Ill., was chosen First Vice-President, General Manager, Director and Member of the Executive Committee of the Owens-Illinois Glass Company, recently formed by the consolidation of the Illinois Glass Company and the Owens Bottle Company, Toledo, Ohio.

W. E. GELLERSEN, vice-president and general manager of the Pacific Coast Operating Department of Libby, McNeil and Libby, was the guest of honor at a banquet held March 12 at the Mark Hopkins Hotel, San Francisco, to celebrate his thirty years of service with Libby.

LLOYD A. HALL, Consulting Chemist, has announced the removal of his laboratories from 934 West Huron Street to 1415 West 37th Street, Chicago.

J. F. LINCOLN, formerly vice-president of the Lincoln Electric Co. of Cleveland, Ohio, is now president of the company. He succeeds J. C. Lincoln, who has been made chairman of the board of directors.

IRA E. MCFARLAND has been appointed district representative in New York and New England for the Jamison Cold Storage Door Company, Hagerstown, Md., and the Stevenson Cold Storage Door Company, Chester, Pa. He will have headquarters at 2 West 45th Street, New York City.

GEORGE F. MITCHELL, chief tea examiner of the Food, Drug and Insecticide Control Division of the U. S. Department of Agriculture, is to join the Postum Co. on May 1 to take charge of the blending and packing of Maxwell House Tea.

GEORGE M. MOFFETT, vice-president of Corn Products Refining Company, was recently elected a director of Childs Company (chain restaurants).

COLONEL LATHAM R. REED of E. A. Pierce & Co. has been elected a director of the American Sugar Refining Company.

GEORGE P. REUTER, vice-president of the Malt Diastase Company, of New York, resigned from that company on April 1, and is now with the Fleischmann Company in the New York office.

LOUIS M. ROEG has been appointed sales manager for the Lucidol Corporation, Buffalo, N. Y. Before accepting his present position, Dr. Roeg was chief chemist of Brewer & Company, Worcester, Mass.

OSWALD SCHREINER, chief of the division of soil fertility of the Bureau of Chemistry and Soils, U. S. Department of Agriculture, will represent the department as delegate to the Fourth Pacific Science Congress to be held at Batavia and Bandoeng, Java, May 16 to June 4, and the Third Congress of International Sugar Cane Technologists to be held at Surabaya, Java, June 7 to 21. Dr. Schreiner will also represent the American Society of Agronomy at the Science Congress.

H. M. SHEA, after a two-year leave of absence, has returned to the Citrus Products Company, Chicago, as vice-president in charge of production and laboratories.

CYRIL SHEEHY, assistant manager of the South St. Paul, Minn., plant of Armour & Company, has been chosen general manager of the same plant to succeed J. J. Luening, who resigned April 1.

Effective May 1, 1929, the editorial interests of FOOD INDUSTRIES on the Pacific Coast will be in the hands of Earl D. Stewart, 883 Mission Street, San Francisco. Mr. Stewart is a graduate of the California Institute of Technology, of Pasadena, having spent his early professional years as Research Chemist for the California Fruit Growers Exchange. From June, 1927, to April, 1929, he was Chief Chemist of the Douthitt Engineering Company, of Chicago, in charge of research on spray drying problems, a post that put him in close touch with many of the more important phases of food manufacture. He succeeds Dr. Paul D. V. Manning, who continues in charge of the Pacific Coast activities of *Chem. & Met.*

Earl D. Stewart

GEORGE STONE, Potomac, Ill., is soil specialist for the Milford Canning Company, Milford, Ill. He will work toward increasing the yield of sweet corn in the Milford area.

JOHN STUART, president of the Quaker Oats Company, has been elected a director of the Chicago & Northwestern Railway to succeed Chauncey M. Depew, deceased.

B. H. THURMAN, formerly of Best Foods, Inc., is now connected with the National Biscuit Company, New York City.

J. F. VELCICH, manager of the Pascagoula Packing Company, Pascagoula, Miss., since its establishment, has resigned to become vice-president and manager of the Mexican Gulf Packing Company of that city.

FRANK W. WADDELL has joined Miller & Hart, Chicago meat packers.

DR. F. C. WEBER, formerly of the division of animal and physiological chemistry of the Bureau of Chemistry, U. S. Department of Agriculture, and more recently with the Fleischmann Company, has resigned to join the research staff of the Atlantic Coast Fisheries.

FRANK C. WHITMORE, for four years head of the chemistry department of Northwestern University, has received appointment as dean of the School of Chemistry and Physics at Pennsylvania State College, to begin on July 1 this year. He succeeds Dean Gerald L.

Wendt who was appointed assistant to the president of the college in charge of research.

OBITUARY

RICHARD R. BEAN, 67, died March 19 at his home in Grand Rapids, Mich. Mr. Bean was born in Wales and came to the United States in 1884. He had been associated with the candy manufacturing business for many years and was president of the National Confectioners Association in 1922-23. He was a director of the Clinton Corn Syrup Refining Company, Clinton, Iowa.

JAMES W. BRICE, secretary and a director of the Sterling Salt Company, New York City, died April 9 of a heart attack, on a New Haven Railroad train near New Rochelle, N. Y. He had been in the salt business since 1887 and secretary of the Sterling Company since its formation in 1906.

CHARLES HIRSCH, 77, previous to 1906 vice-president of the Alaska Packers' Association, died April 7 at the Dante Sanitarium, San Francisco.

RALPH KILMER, 40, vice-president in charge of sales of the Pfaudler Company, died April 5 at his home in Rochester, N. Y., of a heart attack following an illness from pneumonia of less than a week. Although he had been a vice-president of his company but a short time, Mr. Kilmer had had a decided influence in promoting the sales of Pfaudler equipment in the chemical, food and dairy industries.

CHRISTIAN KURTH, 66, president and founder of the Kurth Malting Company, Milwaukee, Wis., died in that city March 6.

THOMAS L. MOORE, 68, proprietor of the Dunlap Mills, Richmond, Va., died recently from pneumonia.

MARTIN NILSSON, 56, head of research department of the Fleischmann Company, died recently of intestinal trouble at the Harkness Pavilion, Medical Centre, New York City. He came to the United States from Sweden in 1905 and had been with the Fleischmann Company since 1912.

MAXIMILIAN STRASSER, 66, a vice-president of the Associated Bakers of America, died April 4 of a heart attack in New York City. He had served fourteen terms as president of the New York State Association of Manufacturing Retail Bakers and became a vice-president of the Associated Bakers when the state association joined the national body.

DEAN A. THOMPSON, 39, President of the Columet Distributing Company since its reorganization as a subsidiary of the Postum Company, Inc., died April 4 of heart disease following an attack of influenza, at the Post-Graduate Hospital, New York City.

GEORGE WEHNER, 79, owner of the city mills of Ste. Genevieve, Mo., died recently in that city. He had been a flour miller for more than 60 years. His son, George N. Wehner, succeeds him in the business.

· NEW · CONSTRUCTION ·

Factory and Equipment Requirements

Bakery—F. Jaeger, 915 Bergenline Ave., Union City, N. J., will soon award contract for a 2 story, 25 x 100 ft. bakery at 913 Bergenline Ave. Estimated cost $40,000. C. G. Eicholz, Jr., 960 Bergenline Ave., Union City, is architect.

Bakery—W. Moellendorf, Fredericksburg, Tex., plans the construction of a bakery. Estimated cost $35,000. Private plans.

Bakery—Rubel Baking Co., Melish Ave., Cincinnati, O., will soon award contract for a 1, 2 and 3 story bakery. Estimated cost $250,000. McCormick Co., South Negley Ave., Pittsburgh, Pa., is architect.

Bakery—Van de Kamps Holland Dutch Bakers Inc., 406 South Main St., Los Angeles, Calif., will soon award contract for the construction of a 4 story bakery. Estimated cost $500,000. McCormick Co., Inc., 41 Park Row, New York, is architect.

Bakery—Wehle Baking Co., Inc., Boston, Mass., plans the construction of a bakery at Hubbard Rd. Youngstown, O. Estimated cost including equipment $250,000.

Bakery Addition — The Hostess Bakery Co., M. L. Livingston, Pres., 285 Madison Ave., New York, N. Y., is having preliminary plans prepared for alterations and additions to bakery at Cincinnati, O. Estimated cost $50,000. Rendigs, Panzer & Martin, 610 Southern Bank Bldg., 519 Main St., Cincinnati. Estimated cost $50,000.

Bakery and Coffee Plant—Koggs-Safeway Stove Inc., 2101 Broadway, Kansas City, Mo., is having plans prepared for a 4 story, 100 x 140 ft., bakery and coffee plant. Estimated cost $200,000. H. Von Unwerth, 705 Finance Bldg., Kansas City, Mo., is architect.

Baking and Distribution Plant—Cramer Bakery Co., 1955 Julian St., San Diego, Calif., awarded contract for the construction of a plant, to P. A. Murray, Holtville, Calif. Estimated cost $100,000.

Bologna Factory—F. Hertler, 118 Lawrence St., New Haven, Conn., is having plans prepared for a 2 story, 52 x 150 ft., factory on State St. Estimated cost $45,000. T. O. Appel, 285 Church St., New Haven, is architect.

Bottling Plant—Coca-Cola Bottling Co., c/o T. L. Bellingrath, 615 East Markham St., Little Rock, Ark., awarded contract for a 2 story bottling plant at Moore and Elm Sts., Morrilton, Ark. to G. H. Burden Co., Moore & Turner Bldg., Little Rock. Estimated cost $75,000.

Bottling Plant—Delaware Punch Co., Del Rio, Tex., will build a 1 story bottling plant. Estimated cost including equipment $30,000. Work will probably be done by owners' forces.

Candy Factory—E. A. Hoffman Candy Co., 634 South San Pedro St., Los Angeles, Calif., is receiving bids for a 2 story, 79 x 220 ft. candy factory at Avalon Blvd. Estimated cost $100,000. C. F. Plummer, Story Bldg., Los Angeles, is architect.

Candy Factory — McPhail's Chocolates Inc., 1534 Walnut St., Jacksonville, Fla., is having plans prepared for a 4 story candy factory. Estimated cost $150,000. R. A. Benjamin, Bisbee Bldg., Jacksonville, is architect.

Candy and Cracker Factory—Brown Candy & Cracker Co., J. L. Brown, 603 Caruth St., Dallas, Tex., plans the construction of a 3 story factory at El Paso and Medina Sts. San Antonio. Estimated cost $200,000. Private plans.

Cannery — Hood River Coffee Growers Association, R. J. McIsaac, Pres., Hood River, Ore., authorized the issue of $75,000 bonds for the construction of a cannery.

Canning Plant—Dublin Canning Co., F. J. Molyneaux, Mgr., Dublin, Ont., plans the construction of a new canning plant to include complete equipment. Estimated cost $25,000.

Canning Plant—Hunt Bros., Hayward, Calif., plans to rebuild canning plant, partially destroyed by fire. Estimated cost including equipment $250,000.

Canning Plant—Nacogdoches Canning Co., c/o R. Jones, Nacogdoches, Tex., plans the construction of a tomato, beet and bean canning plant 40,000 cans daily capacity. Estimated cost $35,000. A. S. Meador, Box 347, Nacogdoches, is engineer. Owner is receiving proposals on cans, scale tickets, shipping crates, tomato gathering baskets, labels, etc.

Canning Plant—Schlesser Bros., Columbia Blvd., Portland, Ore., are completely modernizing plant for canning of and making sausage of horsemeat, to include 30 x 32 ft. kitchen, 15 drying rooms, two smoke houses, grinder and canning rooms, etc. Estimated cost $50,000. New equipment will be required.

Canning Plant Addition—W. Clark Ltd, Harrow, Ont., is having plans prepared for the construction of a 3 story, 50 x 100 ft. addition to canning plant to include 50 x 75 ft. tomato receiving house, etc. Estimated cost $100,000. Machinery and equipment will be required.

Cooking Building—H. J. Heinz Co., F. A. Logan, Local, Mgr., Leamington, Ont., awarded contract for a 3 story, 80 x 100 ft. addition to cooking building, to Emery Construction Co., Windsor, Ont. Estimated cost $50,000. Equipment for cooking ketchup and other products made by the company will be installed.

Co-Operative Products Plant—California Co-Operative Products Co., 150 California St., San Francisco, Calif., is having plans prepared for the construction of a plant to include warehouse and group of storage sheds, at Oakland Estuary, Oakland. Estimated cost $200,000. Weeks & Day, Financial Center Bldg., San Francisco, are architects.

Creamery—Maryville Milk Co., c/o W. F. Phares, Maryville, Mo., will soon award contract for a 2 story creamery. Estimated cost $200,000. R. T. Nunamaker, 706 Citizens Bank Bldg., Tyler, Tex., is architect. Douthett Engineering Co., 139 North Clark St., Chicago, Ill., is engineer.

Creamery—New Prague Co-Operative Creamery Assn., New Prague, Minn., is having plans prepared for a 2 story, 74 x 106 ft., creamery. Estimated cost $50,000. Kampfer & Buelow, 1380 Blair St., St. Paul, are architects.

Creamery—D. Reid, Poteau, Okla., is having preliminary plans prepared for the construction of a creamery. Estimated cost $75,000. Private plans.

Dairy Plant—Consolidated Dairy Co., Colman Bldg., Seattle, Wash., awarded contract for a 2 story, 106 x 160 ft. dairy plant at 831 Elliott Ave. to P. P. Gjarde, Lyon Bldg., Seattle. Estimated cost $200,000.

Dairy Products Plant—A. H. Merriman & Sons, 34 Englewood Ave., Waterbury, Conn., had plans prepared for a 1 story, 40 x 200 ft. dairy products plant to include milk handling system on Hamilton Ave. Estimated cost $40,000. McCormick

Co., Inc., 41 Park Row, New York, N. Y., is architect.

Dairy Plant—Purity Dairies Ltd, H. E. Gignac, Mgr., Howard and Sheppard Sts., Windsor, Ont., awarded contract for a 2 story, 50 x 100 ft. dairy plant on Howard St. to N. R. Ibbetson Co., 3 Ouellette Ave., Windsor. Estimated cost $100,000. Contract for equipment awarded.

Dairy Plant Addition—Ideal Pure Milk Co., R. S. Atkinson, V. Pres. and Gen. Mgr., Evansville, Ind., will soon award contract for addition to dairy plant to include cold storage department, etc. at 8th and Walnut Sts. McCormick Co., Inc., 121 South Negley St., Pittsburgh, Pa., are architects.

Ice Cream Plant—Chapman Ice Cream Co., 8206 Santa Monica Blvd., Los Angeles, Calif., plans a 2 story, 80 x 110 ft. plant.

Ice Cream Plant—O. K. Ice Cream Co., 8th and Main Sts., Pine Bluff, Ark., awarded contract for a 2 story, 80 x 165 ft. plant to E. C. Royce, Pine Bluff. Estimated cost $125,000.

Milk Condensery—Barnes Dairy Products Co., Independence and Clark Sts., Cape Girardeau, Mo., plans the construction of a milk condensery at Independence St. and Highway 61. Estimated cost $50,000.

Milk Depot—Sheffield Farms, Inc., 524 West 57th St., New York, N. Y., plans the construction of a milk depot at Gravesend Neck Rd. and East 17th St., Brooklyn. Estimated cost $50,000. J. C. Schaefer, 52 Vanderbilt Ave., New York, is architect. Also soon lets contract for a milk station, etc. at Bailey Ave. and 192nd St., New York $150,000. F. A. Rooke, 12 East 41 St., New York, Archt.

Milk Plant—Chamber of Commerce, c/o H. Presun, La Grange, Tex., plans the construction of a milk plant. Estimated cost $200,000.

Milk Plants—Carnation Milk Co., 130 North Wells St., Chicago, Ill., plans the construction of two milk plants, one at Sulphur Springs and one at Schulenberg, Tex. Estimated cost $150,000 and $300,000 respectively. Private plans.

Extract Factory—Pond's Extract Co., Clinton, Conn., awarded contract for a 3 story, 80 x 225 ft. factory to Aberthaw Construction Co., 80 Federal St., Boston. Estimated cost $250,000.

Flour Mill—Beaver Flour Mills, Lloydminster, Alta., plans the construction of a new plant. Estimated cost $50,000.

Flour Mill Addition—Royal Milling Co., Ford Bldg., Great Falls, Mont., awarded contract for a 60 x 160 ft. addition to flour mill to Barnett & Record Co., 805 South East 9th St., Minneapolis, Minn. Estimated cost $300,000.

Wheat Mill — International Milling Co., Childs Street, Buffalo, N. Y., will soon award contract for a 2 story, 40 x 80 ft. mill. Estimated cost $50,000. Private plans.

Grain Elevator—Farmers Grain Elevator Co., c/o W. T. Townsend, Mgr., Happy, Tex., awarded contract for the construction of a grain elevator, 75,000 bu. capacity to Star Engineering Co., 211 North St. Francis St., Wichita, Kan. Estimated cost $32,000.

Grain Elevator—Galveston Wharf Co., 2324 B St., Galveston, Tex., plans the construction of a grain elevator, 4,000,000 bu. capacity. Homer & Wyatt, 468 Bd. of Trade Bldg., Kansas City, Mo., are architects.

Grain Elevator—Guymon Equity Exchange, Guymon, Okla., is having plans prepared for the construction of a grain elevator at Hitch, Okla. Estimated cost $25,000.

Grain Elevator—Omaha Flour Mills Co., 25th St. and Krug Ave., Omaha, Neb., awarded contract for the construction of a grain elevator, 500,000 bu. capacity to Jones-Hettelsater, Construction Co., 600 Mutual Bldg., Kansas City, Mo.

Grain Elevator—Texhoma Elevator Co., Texhoma, Okla., awarded contract for the construction of a grain elevator to Jones-Hettelsater Construction Co., Enid, Okla. Estimated cost $125,000.

Grain Elevator—Windsor Grain Elevator Co., Windsor, Ont., awarded contract for a grain elevator, 2,000,000 bu. capacity to Fegles Construction Co., Fort William, Ont. Estimated cost $1,500,000.

Grain Elevator Addition — Galveston Wharf Co., c/o E. W. Parker, 2324 Ave. B., Galveston, Tex., plans addition to grain elevator, 2,000,000 bu. capacity. Estimated cost $300,000.

Grain Elevator and Warehouse—Chicago, Burlington & Quincy R.R., 547 West Jackson Blvd., Chicago, Ill., is having preliminary plans prepared for the construction of a grain elevator 1,000,000 bu. capacity; also warehouse, at Wharf and East Grand Ave., St. Louis, Mo. A. W. Newton, Chicago, is chief engineer. Marshall-Hall Grain Co., Merchants Exchange Bldg., St. Louis, Mo., is lessee.

Grain Elevator and Warehouse—Johns Farm Center, Arbuckle, Calif., plans the construction of a grain and rice elevator, also warehouse to replace fire loss. Architect not selected.

Mill Addition and Grain Elevator—Marshall Mill & Elevator Co., c/o F. Davis, Pres., Marshall, Tex., plans addition to mill to include grain elevator, bins, milling equipment, etc. Estimated cost $100,000. Private plans.

Milling Plant Addition—Ralston Purina Co., 835 South 8th St., St. Louis, Mo., awarded contract for the construction of addition to mill building and grain elevator at Fort Worth, Tex.; also marine leg addition to grain elevator at St. Louis. Estimated cost $200,000. Private plans.

Cold Storage Plant—Swift & Co., c/o O. R. Williams, Mgr., Palestine, Tex., plans a 1 story cold storage plant. Estimated cost $30,000. Private plans.

Cold Storage Plant—Jerpe Cold Storage Co., 12th and Douglas Sts., Omaha, Neb., awarded contract for a 3 story cold storage plant and creamery to V. Ray Gould Co., 1221 City National Bldg., Omaha. Estimated cost $50,000.

Cold Storage and Refrigeration Plant—Southern Ice & Utilities Co., Santa Fe Bldg., Dallas, Tex., plans the construction of a 20 ton cold storage and refrigeration plant at Whitewright. Private plans.

Ice Manufacturing Plant—S. Parisi, 1616 Hendrickson St., Brooklyn, N. Y., plans the construction of a 2 story, 116 x 189 ft. ice manufacturing plant at 111 Northern Blvd., Long Island City. Estimated cost $60,000. Burke & Olsen, 32 Court St., Brooklyn, are architects.

Ice Plant—C. P. Cannella, 1163 Herkimer St., Brooklyn, N. Y., Archt., will soon receive bids for a 1 story ice plant at Garden City. Estimated cost $125,000. Owners name withheld.

Ice Plant—Central Power & Light Co., Frost Bldg., San Antonio, Tex., plans the construction of a 35 ton raw water ice plant at Carrizzo Springs. Estimated cost $50,000. Private plans.

Ice Plant—Daniel Gage Ice Co. Inc., D. L. Lyons, Pres., Lowell, Mass., awarded contract for a 2 story, 60 x 145 ft. artificial ice plant on Pawtucket St., to F. S. Moley, 621 Wymans Exchange Pl., Lowell.

Ice Plant—Delco Ice Manufacturing Co., 1850 South 54th St., Philadelphia, Pa. awarded contract for a 1 story, 40 x 60 ft. ice plant at Holmes, Pa. to W. F. Koelle & Co., 1633 Race St., Philadelphia.

Ice Plant—Dry Ice Corp., 1001 Newark Ave., Elizabeth, N. J., awarded contract for addition to ice plant to H. K. Ferguson Co., Hanna Bldg., Cleveland, O. Estimated cost $50,000.

Ice Plant—Lozano Cold Storage Ice & Power Co., c/o K. Brown, Harlingen, Tex., plans the construction of a 20 ton ice plant at Lozano. Estimated cost $60,000. Private plans. Work will probably be done by day labor.

Ice Plant—Pure Ice Co., c/o W. B. Render, Waxahachie, Tex., awarded contract for a 25 ton ice plant to O. B. Bennett, Waxahachie. Estimated cost $36,000.

Ice Plant—San Antonio Public Service Co., c/o W. Smith, 201 North St. Marys St., San Antonio, Tex. and South Texas Ice Co., will build a 20 ton ice plant at Floresville. Estimated cost $35,000. A. B. & R. M. Ayres, 626 Bedell Bldg., San Antonio are architects. Work will be done by day labor.

Ice Plant—Spears & Miller Ice Plant, subsidiary Texas-Louisiana Power Co., Fort Worth Club Bldg., Ft. Worth, Tex., plans the construction of a 70 ton ice plant at Texas and Alameda Sts., El Paso. Estimated $80,000. Private plans. Work will be done by owners' forces.

Ice and Cold Storage Plants—Union Ice Co., 354 Pine St., San Francisco, Calif., awarded contract for an ice plant at Los Angeles, to Richards-Neustadt Construction Co., 117 West 9th St., Los Angeles; also plans a cold storage plant at Santa Cruz. $40,000.

Pre-Cooling Plant—Security Warehouse & Cold Storage Co., W. D. Lotz, Pres., 350 North First St., San Jose, Calif., awarded contract for an 80 x 185 ft. precooling plant at Santa Clara, to R. O. Summers 17 North First St., San Jose. Estimated cost $50,000.

Chopping Mill — Kruse Bros., Egmondville, Ont., plans to rebuild chopping mill recently destroyed by fire to include complete electrically operated equipment. Estimated cost $15,000.

Meat Plant Addition—J. F. Decker & Sons, Mason City, Ia., is having plans prepared for addition to meat plant. Estimated cost $300,000. Henschen & McLaren, 1637 Prairie Ave., Chicago, Ill., are architects.

Meat Storehouses—First National Stores, 5 Middlesex St., Somerville, Mass., will soon award contract for two meat houses including refrigeration plant on Mystic Ave. Estimated cost $1,500,000 each. Monks & Johnson, 99 Chauncey St., Boston, are engineers.

Packing Plant—Amend Meat Markets, R. Amend, 2203 34th St., Des Moines, Ia., awarded contract for first unit of packing plant to A. H. Neumann & Co., 519 Hubbell Bldg., Des Moines. Estimated cost $25,000.

Packing Plant—McMinnville Packing Co. Inc., L. W. Wells, Pres., McMinnville, Ore., plans a 75 x 175 ft. packing plant. Estimated cost $50,000.

Packing Plant—Rochester Packing Co., F. Tobin, Pres., 900 Maple St., Rochester, N. Y., will soon award contract for the construction of a packing plant to include three cold storage buildings, etc. on Maple St.

Packing Plant—Swift & Co., Union Stock Yards, Chicago, Ill., awarded contract for a 5 story, 36 x 290 ft. addition to packing plant. $198,000.

Packing Plant (Meat)—J. F. Decker & Son, Mason City, Ia., will receive bids about Apr. 20 for addition to packing plant. Estimated cost $300,000. Henschen & McLaren, 1637 Prairie Ave., Chicago, Ill., are architects.

Packing Plant (Meat)—Metzger Packing Co., D. J. Metzger, Red Bluff, Calif., plans the construction of a packing plant at South San Francisco. Estimated cost $500,000. R. C. Stickle, South San Francisco, is architect.

Packing Plant (Meat)—F. G. Vogt & sons, 30th and Race Sts., Philadelphia, will receive bids late in May for the construction of a meat packing plant. Estimated cost $1,000,000. C. B. Comstock, 110 West 40th St., New York, N. Y., is architect.

Packing Plants (Meat)—John Morrell & Co., Ottumwa, Ia., awarded contract for the construction of a meat packing plant at Ottaumwa, to J. M. Tobin, 40 Central St., Boston, Mass., also plant at Mobile, Ala. to R. E. Sundberg Construction Co., Mobile. Estimated cost $150,000 and $100,000 respectively.

Packing Plant (Walnut)—Santa Susanna Walnut Growners Assn., Santa Susanna, Calif., awarded contract for a 1 story, 90 x 140 ft. walnut packing plant to A. Schroeder, Oxnard, Calif. Estimated cost $32,500.

Poultry Packing Plant—Poultry Producers Assn. of Central California, 700 Front St., San Francisco, Calif., have acquired a site at Napa, and plans the construction of a packing plant and warehouse. Estimated cost $40,000. Private plans.

Poultry Dressing and Storage Plant—New York Buyers Inc., c/o W. A. Whorter, 116 Blue Star, San Antonio, Tex., plans a poultry dressing and storage plant at Yoakum. Estimated cost $125,000, also plans three or four plants in South Texas.

Produce Plant—Lubbock Poultry & Egg Co., Lubbock, Tex., awarded contract for a 2 story produce plant to W. G. McMillan, Lubbock. Estimated cost $125,000.

Slaughter House—C. A. Burnett Co., 946 West 38th Pl., Chicago, Ill., awarded masonry and carpentry contract for a 2 story, 56 x 82 ft. slaughter house at 944 38th Pl. to Adams Construction Co., 217 North Clarkson Ct., Chicago. $25,000.

Salt Plant Addition — Alviso Salt Co., Russ Bldg., San Francisco, Calif., is having plans prepared for addition to plant to include loading and unloading bunkers, barges, shovels, etc. at Alviso. Estimated cost including equipment $300,000. Private plans.

Tea and Coffee Factory—Widlar Co., C. W. Brand, Pres. and Treas. 722 Boliver Rd., Cleveland, O., awarded contract for a 3 story, 100 x 280 ft. factory on Berea Rd., to S. W. Emerson Co., 1836 Euclid Ave., Cleveland. Estimated cost $250,000.

Warehouse—The Great Atlantic & Pacific Tea Co., Somerville, Mass., plans the construction of a warehouse at Portland, Me. Architect not selected.

Winery Addition—London Winery Co. A. Knowles, Mgr., The Highway, London, Cnt., is having plans prepared for a 1 story, 80 x 100 ft. addition to factory. Estimated cost $50,000. Watt & Blackwell, Bank of Toronto, London, are architects. Vats and equipment will be required.